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The American Mining Congress

1937
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The Mining Congress Journal

Julian D. Conover, Publisher
E. R. Coombes, Editor

James F. Callbreath — Glenn B. Southward
Albert W. Dickinson — Harry L. Moffett
B. E. Chambers

Vol. 23 JULY, 1937 Number 7

Manufacturers Edition

CONTENTS

Published monthly. Yearly subscription, United States and Canada, $3.00. Foreign, $4.00. Single copies, $0.30. Entered as Second Class Mail Matter, January 30, 1915, at the Post Office at Washington, D. C.

THE AMERICAN MINING CONGRESS
309 Munsey Bldg., Washington, D. C.

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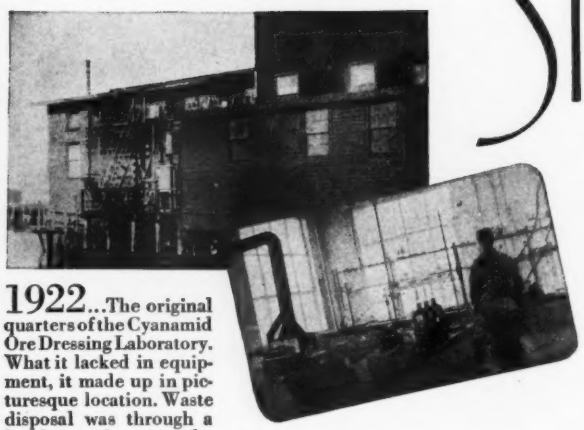
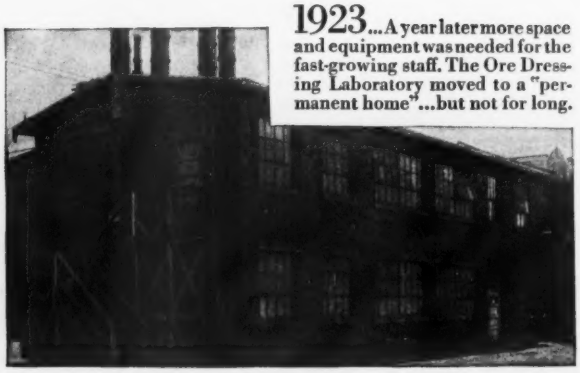
Still Another

IN CYANAMID



1922...The original quarters of the Cyanamid Ore Dressing Laboratory. What it lacked in equipment, it made up in picturesque location. Waste disposal was through a handy trap-door into the river below!

The Cyanamid Ore Dressing Laboratory has moved to enlarged and modernized quarters in the new Stamford Laboratories of the American Cyanamid Co.



1923...A year later more space and equipment was needed for the fast-growing staff. The Ore Dressing Laboratory moved to a "permanent home"...but not for long.

PARALLELING metallurgy's ever increasing emphasis on pure and applied ore-dressing research, Cyanamid has consistently endeavored to keep its research facilities a step ahead of the industry's evident needs. In the past decade and a half the original facilities of the Cyanamid Ore Dressing Laboratory have been increased and modernized on three occasions.

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1926...In less than three years moving day saw the Ore Dressing Laboratory in still larger quarters. Here, complete, up-to-date facilities for chemical and physical tests were provided. Later, a modern microscopic laboratory was added.

1937...Here in a modern, fireproof, air-conditioned building (surburban to New York in Stamford, Conn.) the Ore Dressing Laboratory occupies a floor of nearly 45,000 square feet. Once again equipment is being modernized and augmented.

AMERICAN CYANAMID

A Complete Metallurgical-

30 ROCKEFELLER PLAZA,

Step Forward

SERVICE TO METALLURGY

wholly to physical and chemical research—the Ore Dressing Laboratory occupies substantially larger quarters. Research equipment has been augmented and modernized. Personnel has been increased. In addition, in its new location the Ore Dressing Laboratory will be privileged to enlist the assistance and draw upon the findings of the physical and chemical laboratories and technical staffs of other Cyanamid units.

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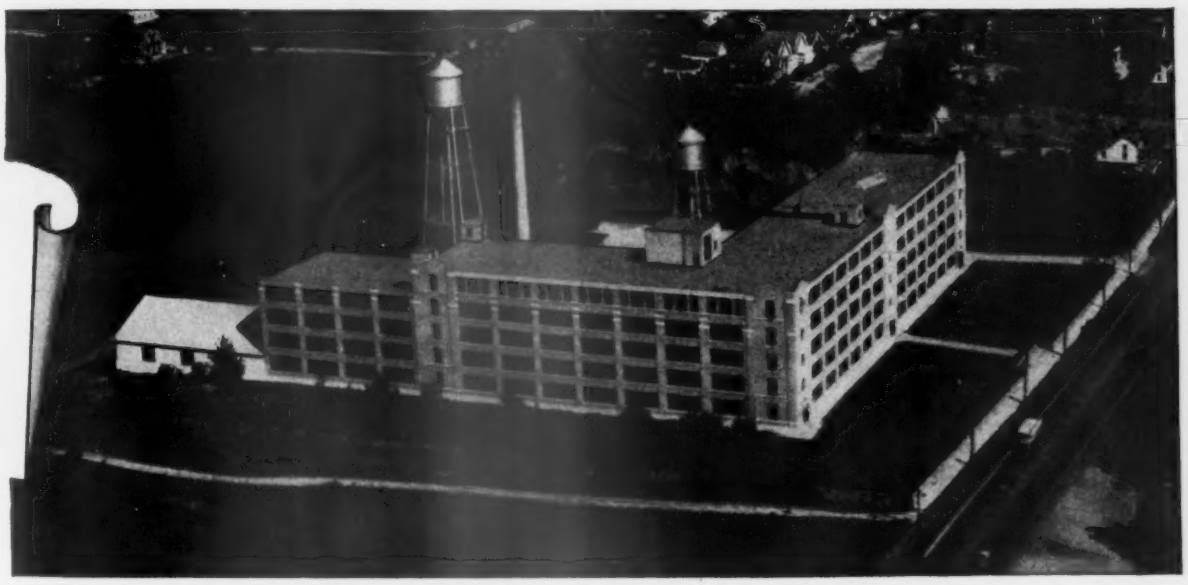

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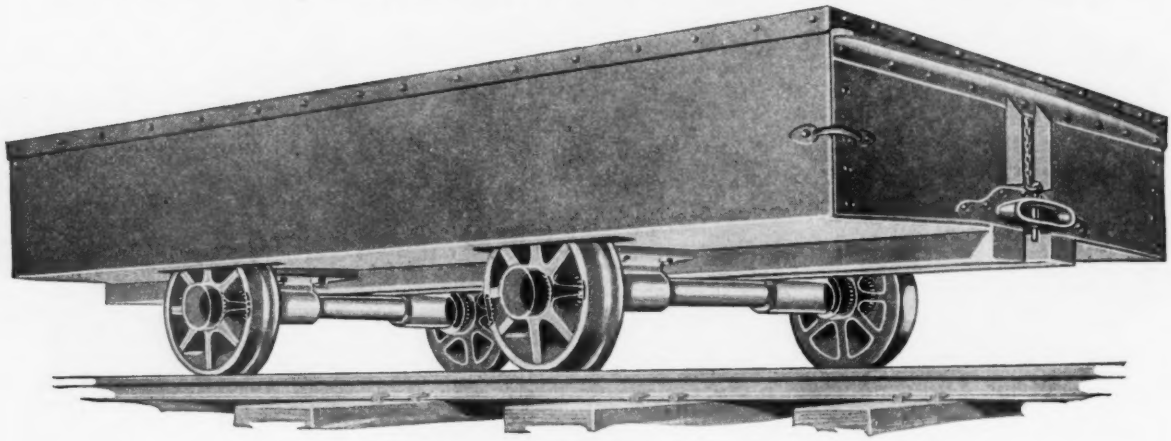
AN X-RAY VIEW OF A MODERN MINE CAR



Tapered Roller TIMKEN BEARING EQUIPPED

A symbol of quality for any piece of equipment with which it is associated

If you could look into all of the new mine cars that go into service you would find more of them equipped with TIMKEN Tapered Roller Bearings than any other make of anti-friction bearing—an overwhelming majority in fact. The same is true of the cars that have been placed in operation during the last fifteen years, more than 250,000 of which have been Timken-equipped. Eliminating friction is a comparatively simple matter, but standing up month after month and year after year under the tremendous radial, thrust and shock loads encountered in mine car service is another story. That is where the TIMKEN Tapered Roller Bearing with shrunk on dust collar (an exclusive feature) has proved its mastery—and therein lies the reason for its continued dominance. No mine car can be considered really modern unless it is equipped with anti-friction bearings and no mine operator can afford to deny himself the benefits of TIMKEN Bearings. It will pay you to insist on having them in your new cars.

TIMKEN Rock Bits eliminate forging, drill faster, last longer and cut drilling costs wherever they are used.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN

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Peabody Coal Co. now has three Link-Belt Simon-Carves washeries in service cleaning their famous S. P. coals.

Link-Belt Company, 300 W. Pershing Rd., Chicago; Philadelphia; Pittsburgh; Wilkes-Barre; Huntington, W. Va.; St. Louis; Kansas City, Mo.; Denver; Seattle or Toronto.

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The Link-Belt Simon-Carves washery installed early in 1935 cleans 1¼" x 0" screenings received in railroad cars from the famous Peabody Central Illinois group of mines.

West Frankfort, Ill., No. 18

The 200 T. P. H. Link-Belt Simon-Carves washery and tipple equipment illustrated above was completed early in 1936.

Harco, Ill., No. 47

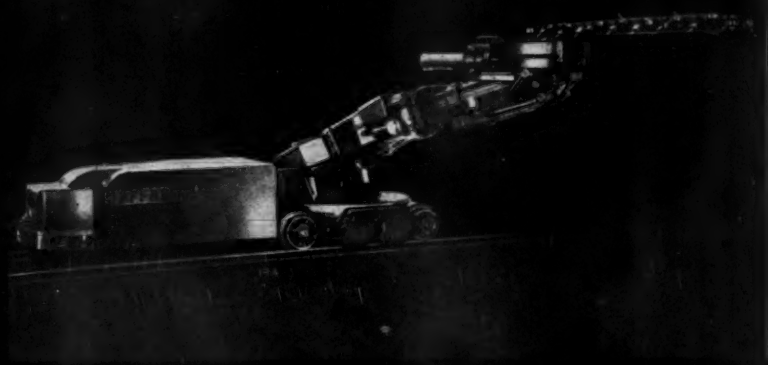
Peabody's latest Link-Belt Simon-Carves washery unit has just recently been put in service at Harco, Ill.

7002

LINK-BELT *Coal Preparation* EQUIPMENT

29-U

CENTER-CUTS



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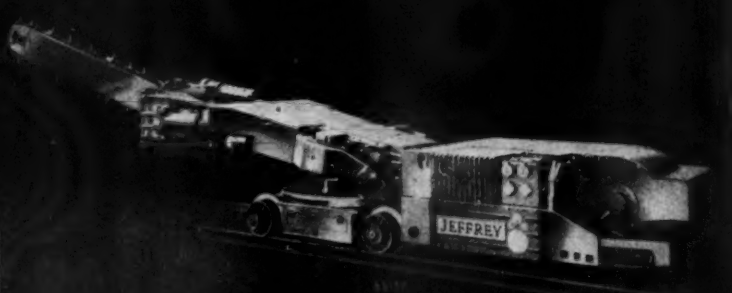
TOP-CUTS

BOTTOM-CUTS



Patented and patents pending—also licensed under E. C. Morgan patent Numbers 1,706,961—1,706,962—1,707,132—1,707,133—1,953,325.

SHEAR-CUTS

Jeffrey

With quick, positive, finger-touch control and universal adjustment, the Jeffrey 29-U coal cutter marks a distinctly forward step in cutting machine design.

It will cut and shear anywhere within the wide range of its cutter bar . . . and do all the other things expected of a truly universal machine . . . slab ribs . . . cut and shear room necks and crosscuts . . . hole breakthroughs. Its extra degree of flexibility is provided by a double pivot arrangement . . . wherein the cutter-head frame is pivoted by turntable, and the cutter bar in turn is pivoted about its sprocket chain. Not one, but BOTH pivots are power controlled.

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One such shot, involving 47 miles of drill holes, containing 110,000 lbs. of GELEX dynamite, brought down approximately 350,000 tons of ore—*the biggest underground shot ever fired.*

Like many other progressive ore mining companies, Climax-Molybdenum finds GELEX dynamite an excellent all-round explosive for underground use—combining high shattering power, with adequate water resistance, remarkable freedom from noxious fumes, and real economy.

The price of GELEX dynamite is lower than that of gelatins. And because GELEX dynamite can be substituted so often for gelatin (when long exposure to water is not necessary) it allows real savings.

Details regarding the special qualities of GELEX dynamite—and expert assistance in its use, if desired—can be secured without charge or obligation from the nearest DU PONT Branch Office.

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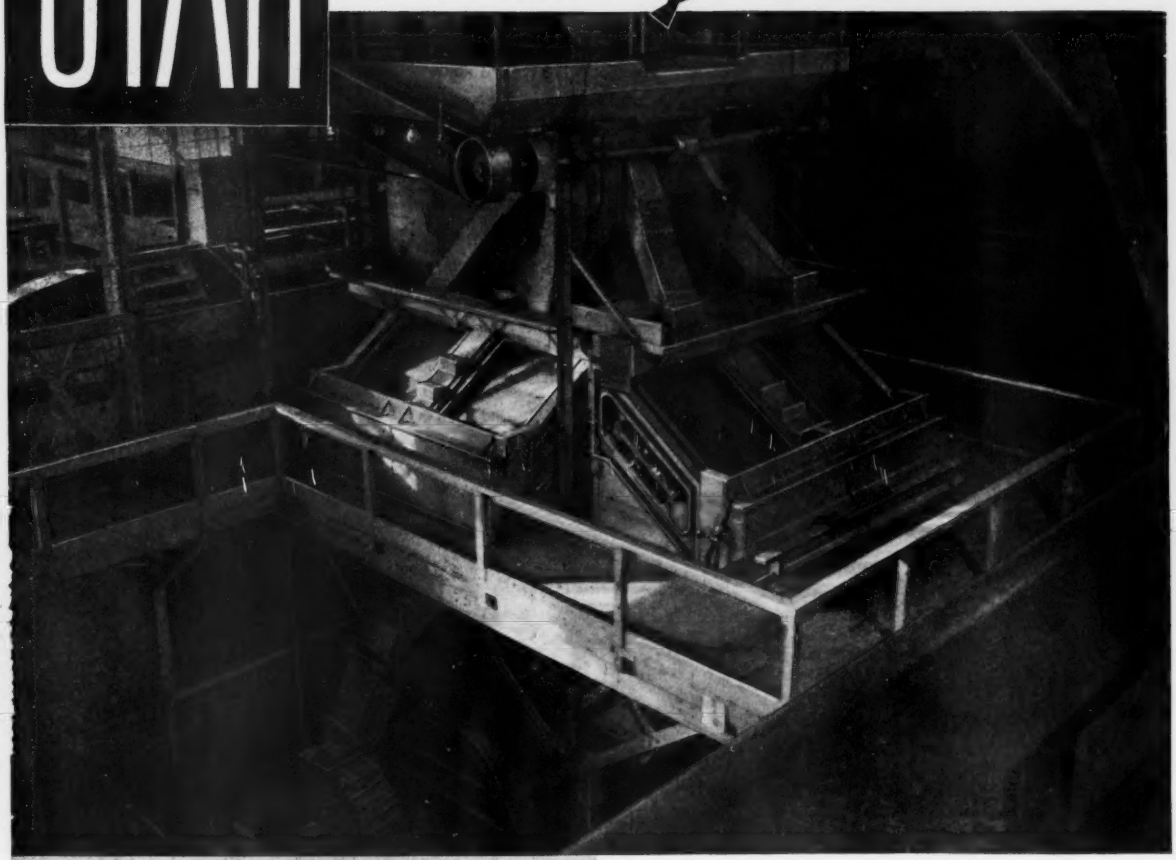
BLASTING ACCESSORIES

UTAH

Positive Electro Magnetic Vibrating Screen



THE UTAH Electro-Magnetic Vibrating Screen was developed about four years ago and since then about fifty units have been put in service. It is a new type of screen, with very low power consumption (0.4 to 0.7 kw for a 4′x6′ screen). Dual magnets, supplied with current from a small bank of copper oxide rectifiers which splits the alternating current wave, give equal and positive motion in opposite directions.

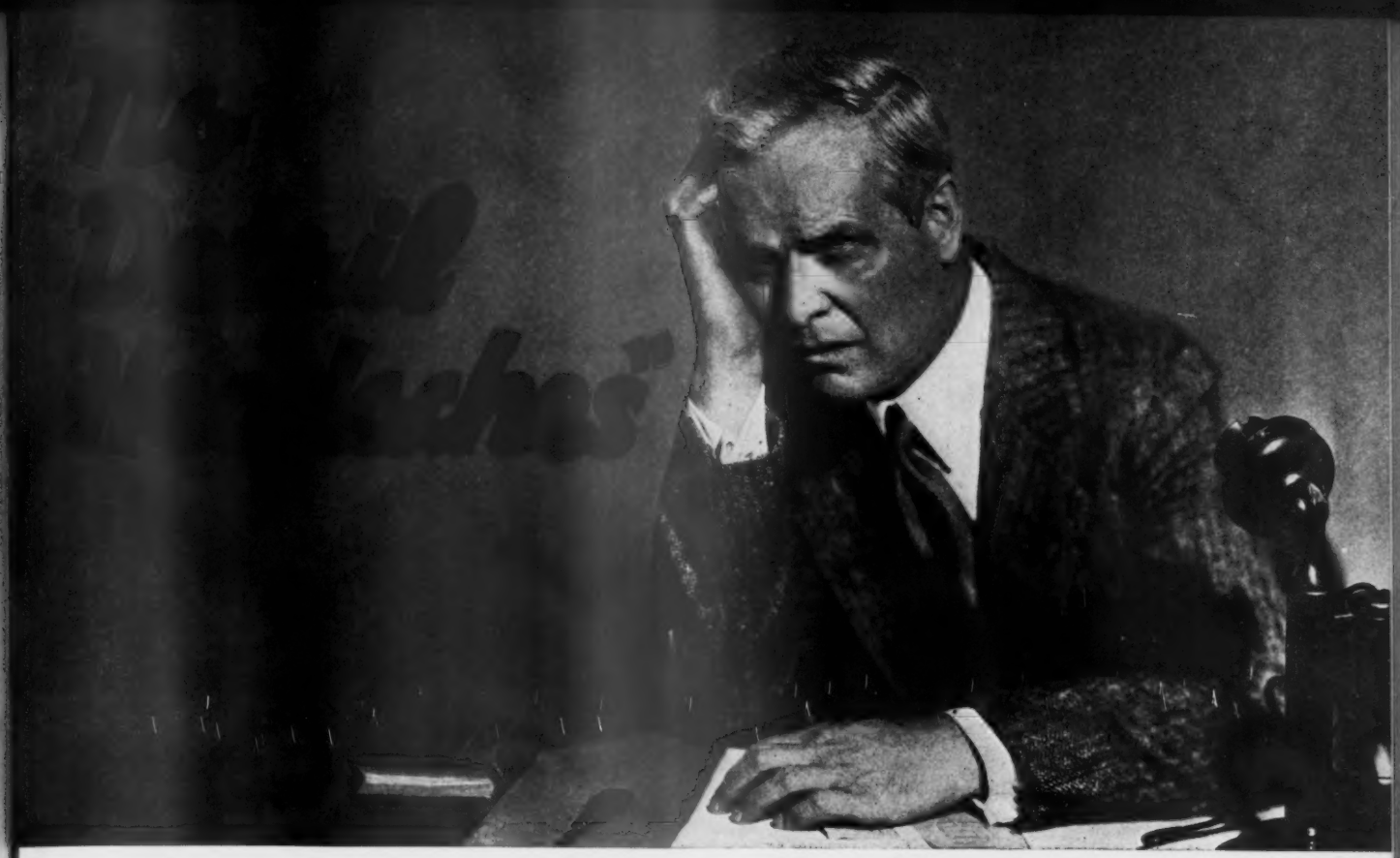
Complete information on these new screens is given in Leaflet 2247. Why not write for your copy now?

781

EQUIPMENT ENGINEERS TO INDUSTRY

ALLIS-CHALMERS

MILWAUKEE WISCONSIN



For Users of O-B Materials!

SUPPOSE we told you that there are instances where O-B mining materials have been in use for over forty years—a *great* many instances where they are still being used after 25 or 30 years of exacting service. *Wouldn't it make a difference when you placed your next order for mine materials*—to know that O-B equipment is designed and constructed to eliminate annoying breakdowns and haulage stoppages for 25, 30 and even 40 years hence? All those "detail headaches" and "tonnage worries" resulting from haulage system breakdowns and power failures would be a thing of the past!

There's only one way to test that statement. *Try these products under actual service conditions in your own mine!* The next time you need new safety switches, section insulators, overhead line materials, automatic motor starters, fused trolley taps, circuit breakers and similar equipment, make it a point to specify O-B, the equipment that takes the headaches out of the tonnage problems.

OHIO BRASS COMPANY

MANSFIELD, OHIO, U. S. A

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont., Canada

1940-M

O-B's Extra Life Brings You An Extra Profit

The Only Remedy

NO QUESTION is ever settled until it is settled right.

Those who view with alarm the present trends in public affairs may be assured that such trends will not lead to permanency, unless the principles involved make for justice as between all parties involved.

Any movement which undertakes to secure benefits for one at the expense of another will end in failure even though temporarily successful.

At this time the industrial centers of this country are in the throes of rebellion. Law enforcement is paralyzed.

Organized armies of striking workmen are openly violating the rights of personal liberty and private property which this Government was organized to protect.

And what is the Government doing?

Nothing except to informally express sympathy with the lawbreakers.

It did enact the Labor Relations Act. This was to make strikes unnecessary by putting union labor in absolute control of industry. Then everybody struck except the American workmen who regarded a bargain to be a bargain and who desired to make good their bargain contracts.

But those who ceased to be workmen by quitting their jobs organized to prevent the honest workman from keeping his contract by resorting to every form of lawlessness.

This Government has not been able to decide whether sit-down strikes are lawful or unlawful.

They are not able to decide whether a workman shall be permitted to fulfill a lawful contract, and, not being able to decide this question, forcibly require workmen to desert their jobs in order to pacify a lawless striking mob and thus prevent them from committing wholesale murder.

And what about law enforcement?

There is none.

A mayor who undertakes to enforce the law finds himself overridden by a Governor, acting in sympathy with the Federal Government and under the general direction of a vicious and lawless minority.

What is the remedy?

Enforce the law.

Administer swift and certain punishment to him who violates the plain legal rights of another.

It is the plain legal right of every individual to have his personal liberty and private property protected against trespass.

Enforce that right by certain speedy and adequate punishment.

What is adequate punishment? Such as will prevent a repetition of the lawless act.

We punish the individual but lack the courage to punish the mob for still more aggravating violations of the law.

Not so long ago the most dreaded and dreadful crime of kidnaping was rampant in the land. Public sentiment was so aroused that the power of the nation was enlisted, and in a short time that form of crime was practically suppressed and its perpetrators were practically extinguished.

Similar determination and action by Government would quickly put an end to mob violence, and strikers would again command public sympathy in their efforts to better their condition and not as now be regarded as criminals or would-be criminals.

There is just one certain remedy for mass violations against the peace and prosperity of the nation.

ENFORCE THE LAW.

J. H. Ellenbrath

The Mining Congress Journal

Vol. 23 JULY, 1937 Number 7

E. R. COOMBES, Editor

A Journal for the entire mining industry published by The American Mining Congress

Self Evident Truth

* * * ***"Property is the fruit of labor; property is desirable, is a positive good in the world. That some should be rich shows that others may become rich, and hence is just encouragement to industry and enterprise. Let not him who is houseless pull down the house of another, but let him work diligently and build one for himself, thus by example assuring that his own shall be safe from violence when built."*** * * *

Abraham Lincoln in 1862 pointed out these self-evident truths. The statement is as true today as it was seventy odd years ago. It would be well for those who are seeking to destroy our democracy because of a greed for power to re-read the wisdom summed up in this quotation.

Power and Responsibility

WITH INCREASING momentum national attention is being focussed upon the labor situation. Each day has brought us closer to the ultimate conclusion that labor unions must be held responsible for their acts. Present legislation is binding upon the employer without a corresponding bond from labor. Further, no labor union is incorporated, and there is, at this time, no completely reliable method whereby the consumer may know whether the elections or polls are correct; there is no way to find out whether a labor union actually represents those it purports to represent. There is no supervision over labor unions, similar to that exercised by Government over industry. While industry—employers—are required under penalties to engage in collective bargaining with their employes and to carry out the bargains made, employes may repudiate or tear up their so-called contracts, and maintain sit-down or walk-out strikes.

A parallel may be found in the British situation, when labor unions believed themselves strong enough to intimidate and dictate to the public. Their attitude resulted in the passage of the British Industrial Disputes Act, which makes strikes illegal if designed to coerce the government directly or by inflicting hardship on the community; it makes picketing illegal if done in such numbers or in such manner that it is likely to intimidate workers.

The time is here when legislation of this character must be enacted in this country. Labor unions must be made responsible for their acts, and must submit to the same type of supervision and regulation that is applied to industry.

The New Technique

UNDER a National Research Project of the Works Progress Administration, a study has been made on recent changes in industrial techniques, and included in the discussion of the results are certain observations on the mechanization of coal mining. We quote:

"It is a striking fact that in Wyoming, Montana, Illinois, and Indiana the only mines which seemed clearly able to survive the intensely competitive conditions of the last decade—aside from strip pits and little truck mines—were the mines that managed to mechanize. They have maintained employment far better than the mines which were unable to adopt the new technique. In any district where costs can be reduced by mechanization, failure to mechanize in the face of competition may actually reduce employment more than mechanization itself.

"The long-run effects of mechanization are clearly favorable to the miner. They lighten his arduous task, increase his productivity, facilitate the payment of adequate wages, and strengthen the industry's position in competing with other fuels. Technologic progress is essential to meet the growing market pressure from petroleum and natural gas."

In adopting mechanical mining methods and devices, management and workmen are partners in the problems that arise for solution and the welfare of both is involved. As yet the new art is in the evolution stage and the rewards are uncertain—losses are not infrequent.

There have been reported instances of attempts on the part of workmen to extend wage premiums allowed to operators of the new machines to all of the men employed including such classifications as timbermen, tracklayers, haulagemen and laborers. Such a treatment will delay progress. Management should not be burdened with additional costs at this stage of the battle to keep market pace with competitive fuels. In due and proper time labor will share with investors in the advances which coal mining is sure to achieve.

RICHARD J. LUND

New Editor of Mining Congress Journal

The American Mining Congress takes pleasure in announcing the addition to its executive staff of Richard J. Lund, who has been appointed Editor of the Mining Congress Journal, effective July 1. Mr. Lund succeeds Mrs. E. R. Coombes, who has resigned to undertake private work.

Mr. Lund comes to the Mining Congress with a broad background of experience in the mineral industries. A graduate of the University of Wisconsin, he has been employed in engineering and geological work, in connection with both coal and metal mining operations, in many localities—including the Lake Superior region, West Virginia, Oklahoma, Texas, the Rocky Mountain states, and Northern Manitoba. He has also devoted special attention to the economics of mineral production, and in the past two years, as chief of the Economics Investigation Section of the U. S. Bureau of Mines, has made extensive studies of copper, lead, zinc, silver and gold mining and milling in relation to the productivity of the labor and machinery employed. He is the author of various chapters in the 1937 "Minerals Yearbook" including a general review or summary of all branches of the mining industry.

Mr. Lund's wide knowledge of mining matters and his broad acquaintanceship will enable him to render a real service to the mining industry in his new capacity.

\+ + +

Wheels of Government

As viewed by A. W. Dickinson of the American Mining Congress

IN JUNE the Vice President also went to Texas to fish. This aroused much comment, but it is believed that he too felt that he should have a vacation for the first time in over 30 years while Congress was in session. There was nothing sudden about his departure, and as a matter of fact, he had planned to go for more than six weeks before the announcement was made public.

There had been much grumbling in the Congress in recent weeks over the Administration methods in connection with the legislative program. An increasing number of the members were resentful toward what they considered to be coercive tactics and the President's 'hillmen" apparently met with more and more resistance. There was much talk of a bolt on the part of the members of Congress for an early adjournment. Something had to be done.

Down in Chesapeake Bay below Annapolis, Md., lies Jefferson Island on which for a number of years there has been a club, including in its membership a number of the leading Administration Democrats. To this island on June 25, 26 and 27 journeyed the President and his staff, to greet over three hundred Democratic members of the Congress, bidden as guests in groups of over one hundred for each day. It was the general opinion that the President's advisors had counselled a peace conference and that they placed their dependence on the President's remarkable ability to sell his ideas to the Democratic members of Congress under circumstances where he could meet them in close personal contact. It will be some days before the results of these confercnces become apparent in the legislative program and it is thought by many that the least result will be the abandonment of the surge for an early adjournment.

Meanwhile, the fan-fare which ushered in the investigation on tax avoidance settled down to days of dull hearings before the Joint Committee authorized by resolution of the Congress. The committee as appointed is under the chairmanship of Representative Doughton of North Carolina who is also the chairman of the Committee on Ways and Means of the House. Other members of the committee are: Senators Harrison (Miss.), George (Ga.), Walsh (Mass.), Democrats; LaFollette (Prog., Wis.), Capper (Rep., Kans.), and Representatives Cullen (N. Y.), Vinson (Ky.), Cooper (Tenn.), Democrats and Treadway (Mass.), and Crowther (N. Y.), Republican.

Secretary of the Treasury Morgenthau made a general presentation on the subject of Tax Evasion and was followed by Undersecretary Roswell Magill who set forth the first eight points of avoidance detailed in the President's message. Mr. Magill then continued:

"The foregoing classifications reflect the present uses of the more important tax avoidance devices as disclosed by the investigations which I have previously outlined for you. That, however, does not present the complete picture of the deficiencies which are inherent in the income tax law as presently constituted.

"As I have said, some of these defects will no doubt be presented to the appropriate committees for consideration next fall, after the present investigation has been prosecuted further. There are, however, three other patent inequalities, two of long standing, on which we already have full information. Needless to say, these inequalities are productive not only of real hardships so far as the general taxpaying public is concerned but also result in a serious loss of revenue.

"1. *Percentage depletion:*

"The Secretary of the Treasury called attention to the desirability of amending the provisions of the law with respect to percentage depletion in his statement presented to a subcommittee of the Committee on Ways and Means in 1933. At that time he said:

"'Our experience shows that the percentage depletion rates set up in the law do not represent reasonable depletion rates in the case of the designated properties, but are much higher than the true depletion to which the taxpayer is fairly entitled. Moreover, these provisions enable a taxpayer to obtain annual depletion deductions, notwithstanding the fact that he has already recovered the full cost of the property. The deduction is, therefore, a pure subsidy to a special class of taxpayers. For this reason the Treasury recommends that these provisions be eliminated, in order to put all taxpayers upon the same footing.'

"The annual loss of revenue from this source is estimated at between 50 and 100 million dollars. The Treasury strongly reaffirms its recommendation made in 1933."

The Undersecretary continued with a discussion of the division of income between husband and wife in the eight community property states and the loss of revenue through the 10 percent withholding rate in the taxing of non-resident aliens.

The Treasury then proceeded to discuss in detail the question of Tax Avoidance and Mr. Elmer L. Irey, chief of the Intelligence Unit, Bureau of Internal Revenue, Commissioner Guy T. Helvering of the Bureau and other specialists detailed the experiences of the Bureau in connection with the use by taxpayers of foreign corporations and foreign insurance companies and personal holding companies. In connection with testimony, the names of many indivduals who had made use of these devices in their tax returns were given publicly to the Joint Committee.

It is not expected that the Treasury will introduce testimony on the subject of Percentage Depletion until the latter part of the hearings. It is even possible that the discussion of this subject may be deferred until later in the year when a subcommittee of the Committee on Ways and Means may undertake a further study with a view to making recommendations for the revision of the revenue laws in the Revenue Bill of 1938.

If and when it becomes necessary to appear, either before the Joint Committee or a Subcommittee of the Ways and Means Committee, to state the views of the mining industry with reference to percentage depletion, the American Mining Congress and individuals from the various mining fields of the United States representing all of the natural resources products will make the appearances. It is unfortunate that so large a proportion of the public, as well as many members of Congress know so little of the thorough justification for the principle of the depletion deduction as a means of the replacement of capital invested in wasting mineral assets. Percentage depletion was only introduced into the law after mature consideration by the Joint Committee on Internal Revenue Taxation, the Committee on Ways and Means, the Committee on Finance, representatives of the Treasury Department and the members of both Houses of Congress in full debate on the floors of both Houses. This method of computing depletion was devised in the interest of simplicity and economy for the Administrative agents of the Treasury and for the taxpayer. Particularly in the case of the small mineral producer is percentage depletion important. Under the old revenue laws he experienced great difficulty in arriving at his depletion deduction and in all too many cases he was denied his rightful deduction under the administration of the law, because of technicalities and requirements

of proof on the part of the Administrative agencies, which he did not know how to produce and in most cases could not afford to furnish.

Further tax activity of the month was the passage by both Houses and the approval by the President, of the Joint Resolution extending the various excise and "nuisance" taxes for two years from the date of their expiration. Many of these taxes were due to expire June 30, and it was necessary that the handling of the Joint Resolution be expedited. It will be remembered that included in these renewed taxes are the import-excise taxes on oil, copper, lumber and coal. Senator Ashurst of Arizona made a stirring defense of the copper import tax on the floor of the Senate. This is so pertinent that certain paragraphs are herewith reproduced:

"I speak more particularly of the tax on copper. I am not familiar with the coal industry or the oil industry, but all my lifetime I have been familiar with the copper-producing industry. I said when the depression came upon us, 'Give us a high protective tariff on copper and Arizona will not ask a dollar of relief.' I repeated that in 1932. I said it in 1934. I say again now, 'Give us a high protective tariff upon copper and Arizona will need no assistance in the way of charity or largesses from the Federal Treasury.'

"For many years—indeed, for decades—Arizona produced one-sixth of all the copper of the world, and for the past 25 years has produced nearly one-third of the copper of the United States. The copper-producing industry in the state of Arizona has increased wages six times within the past year. True, some of the increases were small, but taken altogether they are considerable.

"I hope ultimately, with the assistance of my Republican friends if I cannot secure sufficient aid from my Democratic friends, to secure a high protective tariff for the copper-producing industry, and, indeed, for all other American industries.

"Later having visited the various countries of Europe, having seen the squalor, having seen the poverty, misery, and distress in those countries operating under low tariffs and under free trade, and after making a careful investigation which lasted some years, with the assistance of men able in research, I abandoned my erroneous views regarding tariffs.

"Call it inconsistency if you choose, I saw the error of my way, and reverted to the old Jeffersonian, Jacksonian, Madisonian democratic policy of protective tariffs for American industries. Since that time, in order after a fashion to secure unction for the sins I committed as a free-trader and a low-tariff man, I have sought every sensible opportunity to try to spread the doctrine of high protective tariffs for our country. I believe that our country, our working men, and our industries will not have prosperity without high tariffs. That is democratic doctrine; and those Democrats who are for low tariffs have been led away by some heresy that was declared more than 50 years ago.

"I do not pause merely with a tariff on copper. It would be a selfish, certainly a narrow and circumscribed view, for me to say, 'I am for a tariff on copper, but for free trade on what you produce.' Hence, I am for a protective tariff on products of the American farm, field, forest, factory, ranch, and mine."

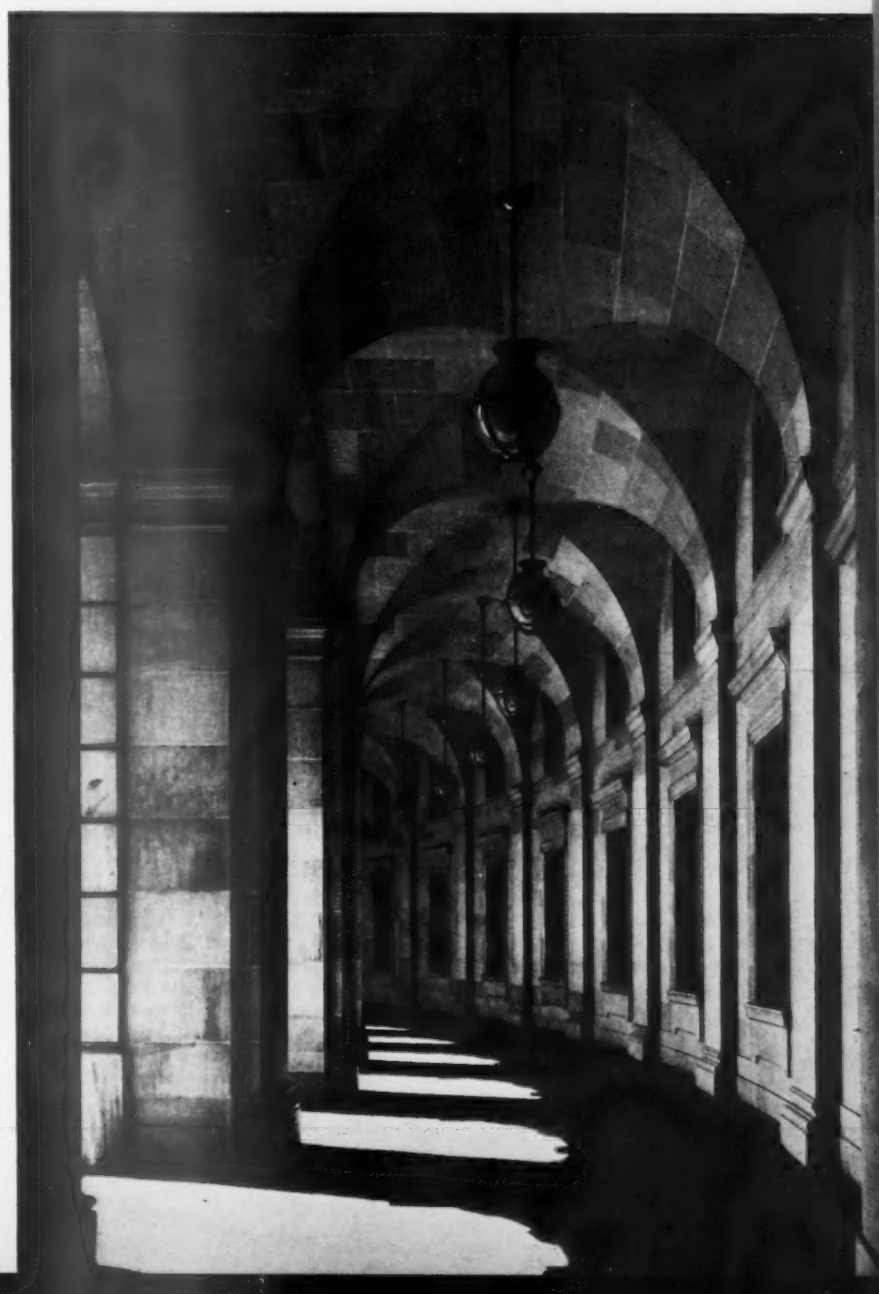
Hearings on the Administration's Wage and Hour Bill, ended during the month and were recessed for a week near the end, because of the death of Co-chairman Connery of Massachusetts. The Joint Committees of the Senate and House heard representatives of labor appove the bill with reservations, and heard representatives of industry protest its enactment.

Prominent among the opponents of the Bill were the mining industries, represented by the American Mining Congress. In stating the position of mining to the Committee, Secretary Julian D. Conover stressed the fact that wages can be paid only from money received from the sale of the products of mining. The Committee was told that the present *effective working day* in both the coal and metal mines of the country is in most cases seven hours or less, and that under the present demand for metals this is no time to reduce hours per shift or shifts per week, especially in the face of a shortage of competent mine workmen.

The harmful effect of hour and wage tampering on low grade and marginal mining properties was clearly set forth, and pointed reference was made to the position of gold mining, which at the present time is struggling against increasing costs of supplies, insurance and

(*Concluded on page* 73)

Courtyard in Circular Plaza of Post Office Department, Washington, D. C.



Black-Connery Wage and Hour Bills

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Statement of the American Mining Congress to the Joint Labor Committees of the Senate and House of Representatives on S. 2475 and H. R. 7200.

By JULIAN D. CONOVER, Secretary
June 11, 1937

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THE American Mining Congress, representing the mineral producing industries of the United States, repectively protests the enactment of S. 2475 and H. R. 7200, known as the Fair Labor Standards Act of 1937.

As a general statement of our position, we should like to quote the following from the Declaration of Policy adopted at our Denver Convention, October 1, 1936.

"The establishment of wage levels by legislation or fiat of governmental authority is contrary to sound economic principle. Wages ultimately are paid from income; income results only from production and is not created by law.

"The mining industry as a whole recognizes its responsibility to its employes and to the communities where it operates, and has met that responsibility by maintaining extensive employment all during the depression. It has established its operations on the basis of fair and reasonable daily and weekly working hours, which compare most favorably with those in other industries, and which have permitted maximum efficiency, safety and satisfaction to all concerned. We oppose any proposals to further restrict working time by legislative action.

"We believe in the best possible working conditions for the employes in the mining industry and approve all reasonable and proper measures for promoting their health and safety."

The primary objective of the legislation now before your committees is evidently the correction of certain abuses in the employment of labor, notably child labor and "sweatshop" conditions.

The mines of this country do not, so far as we have any knowledge, employ children; we can say definitely that in the mining industries child labor is not a problem. Sweatshop conditions, with oppressively long hours or low wages, likewise do not exist in mining. Wages of mine employes are substantially in excess of the statutory minimum contemplated in these bills. We are in full sympathy with the praiseworthy purpose of eliminating child and "sweated" labor, but we respectfully submit that this objective may be achieved without the necessity of a law which would provide centralized, bureaucratic regulation of all lines of productive enterprise, and which would hinder the creation of new wealth from our mineral resources.

Specifically we oppose these bills for the following reasons:

1. *They would impose upon the mining industry arbitrary regulation contrary to natural economic forces.* The producer of basic raw materials, such as minerals and metals, must sell his product in a broad competitive market in which prices are determined by world conditions. His income is derived from the sale of his product, and wages can be paid only from such income. The history of the mining industries shows that mine workmen have consistently received the benefit of higher prices for the product in the form of higher wages. Conversely, when prices recede, either wages must be lowered to correspond or the mines must close down, with consequent unemployment. Imposition of uneconomic wage and hour levels by a Federal Board, under the sweeping powers conferred in these bills, would inevitably bring the latter result.

2. *Reduction of working hours, as contemplated in these bills, would seriously interfere with the operation of many mines.*

In metal mine operations the standard working day is 8 hours; in coal mines it is 7 hours. However, the 7-hour day in coal mining applies to actual hours of work *at the working place*, whereas in metal mining the 8-hour day includes time consumed in traveling from the surface to the working place, or in returning to the surface at the close of the shift, or both, as well as time required for lunch, and *actual working time* is usually less than 7 hours. During each shift a complete cycle of mining operations must be performed—including b a r r i n g down loose rock, mucking out for set-up, setting up the drill, drilling a round of holes, tearing down, charging the holes, and blasting—all of which must be completed during the shift in order that the interval between shifts may be utilized for clearing out the toxic gases which are produced in blasting. Shortening of the work-day would prevent the completion of this cycle, necessitating the use of split-shifts, an extremely dangerous and impractical procedure.

Reduction in the number of days per week would be equally objectionable. The present increased demand for many mineral products requires full-time operation of both mines and treatment plants, which in many cases is not possible with a 5-day work-week. Many of our largest mines are in localities remote from populous centers, and housing facilities are not sufficient to care for the additional personnel that would be required if workers were limited to 5 days per week; in addition, the limited life of certain mines would preclude additional investment in housing. Isolated mining camps find that they can not secure qualified workers if the men are not permitted to work more than 5 days per week; good miners will not work in such camps except on a continuous basis for a number of weeks, with occasional lay-offs of several days to go home or to the city. In many cases, also, rigorous winter conditions limit operations to the summer months, and it is highly important that the workmen be permitted to work as many days as practical during the working season.

In most mining districts there is no additional supply of competent mine labor, such as would be needed with a 5-day maximum week. On the contrary, there is today a shortage of competent mine workers. Untrained labor cannot be put to work in a mine as in agriculture or in some easily-supervised manufacturing enterprise; careful training is

(*Concluded on page* 74)

Fundamental Taxing Requirements of the Social Security Act*

DELINQUENT employers in the mining industry were recently advised by Commissioner of Internal Revenue Guy T. Helvering to make immediate tax returns as required under the provisions of Titles VIII and IX of the Social Security Act to avoid further payment of drastic penalties which are now accruing.

Commissioner Helvering pointed out that every person employed in the mining industry came under the provisions of Title VIII, which imposes an income tax on the wages of every taxable individual and an excise tax on the pay roll of every employer of one or more. This tax is payable monthly at the office of the Collector of Internal Revenue. The present rate for employer and employe alike is 1 percent of the taxable wages paid and received.

Under Title IX of the Act, employers of eight or more persons must pay an excise tax on their annual pay roll. This tax went into effect on January 1, 1936, and tax payments were due from the employers, and the employers alone, at the office of the Collector of Internal Revenue on the first of this year. This tax is payable annually, although the employer may elect to pay it in regular quarterly installments.

The employer is held responsible for the collection of his employe's tax under Title VIII, the Commissioner explained, and is required to collect it when the wages are paid the employe whether it be weekly or semi-monthly. Once the employer makes the 1 percent deduction from the employe's pay, he becomes the custodian of Federal funds and must account for them to the Bureau of Internal Revenue.

This is done, Mr. Helvering said, when the employer makes out Treasury form SS-1, which, accompanied by the employe-employer tax, is filed during the month directly following the month in which the taxes were collected. All tax payments must be made at the office of the Collector of Internal Revenue in the district in which the employer's place of business is located.

Penalties for delinquencies are levied against the employer, not the employe, the Commissioner pointed out, and range from 5 percent to 25 percent of the tax due, depending on the period of delinquency. Criminal action may be taken against those who willfully refuse to pay their taxes.

The employers of one or more are also required to file Treasury forms SS-2 and SS-2a. Both are informational forms and must be filed at Collectors' offices not later than next July 31, covering the first six months of the year. After that they are to be filed at regular quarterly intervals. Form SS-2 will show all the taxable wages paid to all employes and SS-2a the taxable wages paid each employe.

Participation in a state unemployment compensation fund, approved by the Social Security Board, does not exempt employers from the excise tax under Title IX, Commissioner Helvering said. Nor does the fact that there is no state unemployment compensation fund relieve the employer of his Federal tax payments. In those states where an unemployment compensation fund has been approved, deductions up to 90 percent of the Federal tax are allowed the employer who has already paid his state tax. These deductions are not allowed unless the state tax has been paid.

This tax is due in full from all employers in states having no approved fund. The rate for 1936 was 1 percent of the total annual pay roll containing eight or more employes, and for 1937 it is 2 percent. The rate increases to 3 percent in 1938 when it reaches its maximum. The annual returns are made on Treasury form 940.

An employer who employs eight or more persons on each of 20 calendar days during a calendar year each day being in a different calendar week, is liable to the tax. The same persons do not have to be employed during that period, nor do the hours of employment have to be the same.

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Actual money, when paid as wages, is not the sole basis on which the tax is levied. Goods, clothing, lodging, if a part of compensation for services, are wages and a fair and reasonable value must be arrived at and become subject to the tax.

Commissions on sales, bonuses and premiums on insurance are wages and taxable.

Officers of corporations whether or not receiving compensation are considered employes for the purpose of taxation.

Wages paid during sick leave or vacation, or at dismissal are taxable.

Traveling expenses required by salesmen are not wages if the salesmen account for, by receipts or otherwise, their reasonable expenditures. That part for which no accounting is made is construed as a wage and is taxable.

Exercise great care in filling out Treasury forms SS-1 and 940. Directions are easy to follow and correct returns mean no unnecessay delay.

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* Released by the Bureau of Internal Revenue.

Of All Things . . .

An elderly lady tourist, boarding the subway car that leads from the Senate Office Building to the Capitol the other day, told the driver to take her to the White House. . . . Patiently he explained over and over again that the subway doesn't go to the White House. . . . She remained adamant. . . . She had been told by friends that there was a connection between the Capitol and the White House. . . . And maybe the lady wasn't so far wrong, at that. . . .

Taxes eat up so much of a rich man's estate when he dies that one can't blame a rich man if he just goes on living for spite. . .

The President, a White House liason man hints, has quietly dropped his six-judge court plan. . . . It may have dropped quietly but it sure made a lot of noise before it hit. . .

Everybody is picking on Vice President Garner for taking a vacation. . . . Did you ever try trout fishing in the blazing sinkhole that Washington is during the summertime?

Over in London, on a recent hot day, the judges removed their wigs. . . . Over here, we're more modern. . . . We remove the judges. . . .

The Nation's gold supply is now safely buried at Fort Knox. . . . Safe from everybody except the President and the Congress and the Congress isn't sure just how far it can go. . .

With minimum wages and such things, you can expect the next Administration step will be to tell Father how much the minimum allowance should be for Junior. . .

A leading writer says that economy is the only thing that will save civilization. . . . Goodbye, Civilization, mighty nice to have known you. . . .

June may be the month of rare days for the rest of the country but in Washington it's the month of hot days. . . . And the heat has even spread to the point of being felt in the air-cooled White House. . . .

When Joe Robinson says it's time to think seriously about the Government debt of $36,000,000,000, well, then it's time to think seriously of the Government debt of $36,000,000,000. . . .

With one thing and another, it's gotten so that the boss doesn't know whether it's safe to ask the job applicant to take a seat. . . .

Scientists at the Terrestrial Magnetism Laboratory have discovered that the force which binds nuclei of atoms together is 36,000,000,000,000,000,000 times as great as gravity. . . . If they really want to deal in large figures, why don't they investigate the Government debt? . . .

With prices getting to be what they are, a lot of us hope the Supreme Court will have a chance to do to the HCL what it did to the NRA. . . .

Proponents claim "little NRA's" are all right. . . . Maybe so. . . . But little ones have a habit of growing into big ones. . . .

It's a good thing Congress decided to continue the CCC, even for a limited time. . . . The way things are moving, it isn't going to be long before most of us will be looking for a lot of tall timber to take to. . . .

We'll bet that those Russians were surprised not to find a Tugwell resettlement project up at the North Pole. . . .

Experience teaches that budget balancing starts in the home and grows more and more difficult as it progresses toward the Federal Treasury. . . . With the observation that some people obviously didn't have any experience in the home. . . .

Leave it to the magicians to do the right thing. . . . Their national organization just chose a Washington man its chief. . . . Considering the "rabbit-out-of-the-hat" program now in vogue, Washington is the place to find any number of people qualified to head a magicians' society. . . .

Women, says a Treasury report, now control 70 percent of the wealth of the nation. . . . That leaves 30 percent divided up between the bachelors and the Government. . . .

—The Picture Story of Steel.

As the Manufacturer Sees It—

The following pages present the Manufacturers' View of Service to the Mining Industries

—The Picture Story of Steel.

SCIENCE and INVENTION—
Allies of Modern Mining

Presented by—

Sullivan Machinery Company
Joy Manufacturing Company
Goodman Manufacturing Company
Allis-Chalmers Mfg. Company
Bethlehem Steel Company
Westinghouse Electric & Mfg. Company
Jeffrey Manufacturing Company
McNally Pittsburg Mfg. Company

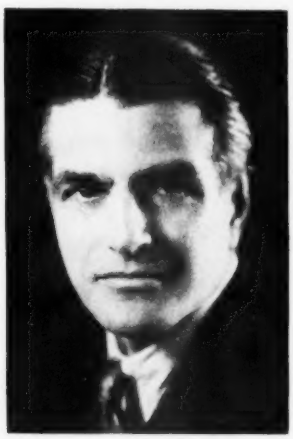
SERVICE—A Keynote to Success

By HENRY S. BEAL*

THE success of the builder of equipment is measured by his ability to be of service to the user. The interests of the coal producers and the mining machinery builders are, therefore, identical.

Producers of coal conduct their businesses profitably if they have a satisfactory margin between cost and selling price, with the price fixed quite largely by demand and competition of other sources of energy.

Builders of mining machinery can perform their service only if they carry on their businesses at a profit. They must, however, remember that they are not selling a commodity, but an engineering service. This service, if properly performed, will develop implements for taking coal from the seam to the surface at



Henry S. Beal

* President, Sullivan Machinery Co.

a total cost which will make a profit possible for the producer. The machinery builder in studying new methods and processes must take into consideration the wage scales effective, the labor-saving possibilities of his new machine, the value of the machine when capitalized for its labor-saving qualities, and the cost of developing and building such a machine. This cost is, again, dependent upon the numbers of the machine which can be sold, the cost of developing it, etc.

The current disputes as to the effectiveness and desirability of labor organizations have tended to distract attention from ideas as to wages which have in the past years come to be considered as fundamental by American business.

We have built up in this country a tremendous industrial life, the survival of which is dependent upon the existence of a purchasing power equal to our production. The great bulk of articles produced in this country is either of consumer articles, which can be consumed only if they are bought by the generality of the population, or of durable goods for the production of these same consumer goods.

Theoretically speaking, the rate of wages paid to different types of workers should not result from competition between the worker and his employer as to how little the employer will give or how much the worker can get, but rather should be based upon the productivity of the tools of production of the working class.

In practice it is, however, true that wage rates of all workers must bear a relationship to the cost of living and the standard of living, which wage rates are dictated by the productivity of the instruments of production in our major industries. To take an extreme example, the machines of production in the automotive industry are so effective that automobile workers earn between $5 and $10 a day, and the cost of automobiles has continually come down. The custom tailor, on the other hand, uses practically the same equipment today that he used 200 years ago, and because he has to pay the wages common to the automotive industry he is obliged to sell his suits for prices ranging between $75 and $150, and the custom tailoring business has practically disappeared in favor of the manufacturing tailor.

There is a growing belief in the coal-mining industry that mechanization cannot only keep up with the rising wage scale in this country, but that it can also get ahead of it, and that it is not impossible to believe that the cost of coal as compared with other sources of energy may be reduced.

The machines shown by the various builders at the recent exhibition of the American Mining Congress demonstrated that these builders do appreciate the profit possibilities of the coal industry.

Further MECHANICAL DEVELOPMENT in Mining Depends on Cooperation Between Coal Operators and Machinery Manufacturers

By W. E. BARROW*

THE successful development of machinery in the coal industry is a broad problem covering and including the technical and practical experience of both the manufacturers and the coal operators.

In most cases, the manufacturer has available all the information pertaining to steel, electrical equipment and engineering which is necessary for the development of coal mining machinery. The practical development and application of this machinery must, of necessity, be finished in the mines. This is the reason why manufacturers must depend on the cooperation of the coal mine operator. Without this help, the development of adequate machinery for the present and future needs would be slow and difficult.

The manufacturer is striving at all times to develop new ideas and to improve present equipment to handle individual operations more efficiently. Most coal properties have conditions peculiar to their own seam and general locality, requiring special devices to handle the operating problems. It is obvious, therefore, that the manufacturer and coal operator must work together in the practical development of mechanical equipment in order that these individual mining and operating problems may be successfully met.

In the past, most of this development was carried on by the manufacturer who originated new ideas and sold them to the coal mine operator.

It is not to be construed that the manufacturer desires to shirk his responsibility, but if the industry expects to have its machinery requirements properly engineered and developed, it is essential that the equipment can be projected and properly built. To meet the constantly changing economic conditions, the coal operator must assist in the practical development of machines if his requirements are to be satisfied promptly.

The complete mechanization and modernization of mines has, in many sections of the country, demonstrated that machinery is making the mines much safer and is reducing man-hour losses to the minimum which in turn effects a considerable saving in compensation. The greater safety to men and property resulting from mechanization is something that the coal industry is just beginning to realize and future possibilities in this direction can be appreciated only as time goes on, more equipment is installed, and more concentrated supervision is exercised in coal properties.

* President, Joy Manufacturing Company.

W. E. Barrow

The use of modern machinery and methods throughout the manufacturing industry as a whole (and we must consider coal mining as a manufacturing industry) has resulted in reducing labor fatigue and improving working conditions and is certainly well worth the investment, effort and development required. It is the opinion of many operators with mechanical experience that the miners themselves will demand more mechanization to reduce their individual burdens and laborious duties and to eliminate the hazardous tasks now being done by hand.

Practically all manufacturers have a highly trained, both technical as well as practical, organization of engineers and technicians schooled in:

Safety Underground
Development of Coal Mines
Efficient Production of Coal
Efficient Transportation of Coal
Efficient Underground Supervision
Application of Machinery to Underground conditions.

The manufacturers are willing at all times to use this special organization to assist coal operators in working out the many problems in connection with the mechanization of coal properties. The manufacturers also welcome constructive criticism and suggestions from the operators and miners.

With the technical information available from the manufacturers and with the practical experience emanating from the operators, the development of new machinery in the future holds forth tremendous possibilities for greater safety, reduction of mining costs and more economic and efficient operation in the mines. With this cooperation, the coal industry can overcome several major problems facing the industry today, as well as secure:

1. Greater safety to life and property

through complete machine operation from face to tipple.

2. More efficiency in the operation of all phases of mining through trained supervision and education of personnel.

3. More stability from the economic point of view of the entire mining industry, which is sorely needed in many operations today, and which can be gained only through efficient and scientific application and development of machinery to meet the individual problems of each operator.

The coal industry has the right to regain and maintain its position as the chief supplier of B. T. U.'s for the business of the United States, and this position can be attained only through cost reduction and the sincere cooperation of manufacturers of equipment and coal mine operators.

The PURPOSES of the Manufacturers Division and Its Plans for 1938

By WILLIAM E. GOODMAN*

THE original purpose for which the Manufacturers Division of the American Mining Congress was formed in 1922 was the promotion and carrying out of an exposition of mining machinery and supplies. This exposition was planned to be held at the same time and place as the Annual Coal Convention of the American Mining Congress. Beginning in May, 1923, and continuing year after year, such combined expositions and conventions have been held until the number has grown to a total of 14, the fourteenth being the convention just concluded in May, 1937, at Cincinnati.

Year by year the staff of the American Mining Congress has become more experienced and the manufacturers themselves have learned how to put on exhibits that have become progressively more attractive, more complete, and more instructive. While the general characteristics of the expositions have not changed radically, many detailed experiments have been tried and accepted or rejected after having been put to an actual test.

It would now appear to be very clear that the exposition and the convention have reached the point of outstanding value to the operators of coal mines. The greatly increased attendance at the recent exposition and convention is convincing evidence on this point.

For 1938 another convention is being planned and with it an exposition which will be better and more valuable to the mining industry than the past expositions.

William E. Goodman

A second purpose has resulted from the steady growth of interest in the exposition, which has resulted in the creation of an organization of operators for the purpose of sponsoring and furthering the use of mechanical means of production. The present highly-efficient group of committees known as the Operators Committees each year studies the most modern mining practice on all phases of production and their work culminates in the presentation of papers and the sponsorship of the convention held simultaneously with the exposition. A closer cooperation between the manufacturer and the producer has been in evidence during the last few years, and it is anticipated that continued cooperation between the Operators Committees and the Manufacturers Division will yield increasingly valuable results.

Plans for 1938 include a widening of these studies of the Operators Committees with the resulting important papers to be presented at the Cincinnati convention.

Creating EFFICIENT MINING Industry Through MACHINERY and RESEARCH

By S. D. MICHAELSON*

THE mining industry has been improved so continuously through the utilization of research and its consequent operational betterments, that we are prone to accept these improvements as a matter of course. Mining, in the days of hand drilling and primitive methods, with the unsafe practices in vogue, makes a decided contrast to the modern highly mechanized and equally efficient mining plant. Improved production methods resulting from a better understanding of the theoretical principles involved have not only simplified the function of labor, but have further justification in a reduced cost of product, and a consequent higher standard of living for all concerned.

The relationship between research, new and better machinery, and increased efficiency at operating mining plants, is so interlocked that it is difficult to segregate these items. Theoretical research, before translation and application, has in itself no immediate practical or economic value. When developed into practical research and tempered by empirical experience it becomes the basis for new and improved machinery. When this step has been accomplished the next one of building the machine and proving it in practical operation is not so difficult; and it becomes one of mechanical construction and field testing.

This normal sequence of research and development has produced those things our ancestors hoped for but could never afford, and other wonderful things they never dreamed of.

In the space of this article it is impossible to discuss in detail the many improvements that modern machinery manufacturers have made available to the mineral producing industries. In a general way we may start with our recently gained knowledge of metallurgy, and follow that through to find the hundreds of new alloys each developed for its special intended use. The discovery of these many alloys led to the design of better bearings, lighter and stronger skips and mine cars, more efficient crushers and concentrating machinery, better electrical equipment, as well as thousands of other improvements to produce more at less cost.

Our academic studies, which led to a better understanding of electrical phenomena, gave us a cheap and marvelously convenient source of power. No longer are we required to energize our machines by cumbersome and unsafe lineshafts—no longer must we bother with inconveniently small steam plants. Instead, we obtain our power from, or make it in large efficient electrical generating stations. Safety, health, employes, employers, and last but not least, consumers, all have benefited.

The development in the field of power generation has enabled our technicians and operators to make equally great strides in the actual mechanics and economics of mining. Mechanical loaders, improved cutting equipment, better drilling equipment, and the new rotary rig for shaft drilling, have all led toward greater production at lowered cost. Above ground, the ores are crushed in better crushers, ground in better grinding mills, and concentrated in better concentrating equipment than ever before.

All this has been brought about by the foresight of our machinery manufacturers in promoting scientific research with an open mind, and developing those new ideas that are worthwhile to the point where producers can use them to advantage. The manufacturing industry realizes the part they must take in con-

* Vice president, Goodman Mfg. Co., and chairman, Manufacturers Division, The American Mining Congress.

* Mining Division, Allis-Chalmers Mfg. Co.

stantly striving toward greater improvement in machinery and methods. It is by this course that the mining industry will continue to obtain at reasonable cost those machines that mean better extraction or recovery of the mineral products, and consequent economic improvement and social betterment.

MACHINERY as an Aid to an EFFICIENT MINING Industry

By R. L. GILLISPIE*

LIKE most other industries coal mining is feeling the urge of modernization. Increasing tax burdens and rising wages, growing competition from other fuels, and greater demands for safety are forcing operators to depart from time honored procedures and to adopt better and more efficient equipment.

Not until the early twenties did the industry, as a whole, pay any real attention to the cost of transportation within the mine itself; a variety of nondescript cars and track equipment was used. Then, as operators realized that a better track system meant better economy a period of modernization followed which resulted in material improvements in this condition.

However, this did not bring the development of track equipment to a final conclusion. Further needs for economy led to a far reaching mechanization of the mining operations. Large cutting machines were introduced, mechanical loaders replaced hand loading, and big metal cars appeared instead of the small wooden hand cars. To accommodate this heavy duty equipment it was necessary to go to increased rail sizes, and to adopt steel ties and improved frogs and switches. Economic considerations also dictated that this expensive track mounted equipment had to be kept in operation as much as possible of the time. This created demands for extra flexibility of all track equipment. Tracks had to be laid down and taken up more quickly than before, the frequent changes in rooms and turnouts had to be effected in shorter time, and all tracks had to be well leveled and properly gaged to allow movement at the highest possible speed.

This tendency toward mechanization, which is of comparatively recent date, is rapidly gaining momentum. A good illustration of this is furnished by West Virginia, one of our leading coal producing states, where mechanical loading showed an increase of 430 percent in 1936, with nearly 9,000,000 tons, compared with about 2,000,000 tons mechanically loaded in 1935. Of the total coal production of this state only 2.1 percent was mechanically loaded in 1935, against 7.4 percent in 1936. For the first month of the current year this figure has reached 12.0 percent.

Manufacturers of mining equipment are not turning a deaf ear to the miner's call for relief from mounting costs. Frequently anticipating the producer's need they have come to rescue with equipment that is more economic in operation and in upkeep, flexibility and dependability have been increased, greater safety has been attained, and much drudgery and hardship have been eliminated from labor. Research and extensive tests, together with a good knowledge of the problems and requirements of the mine operator are essential requisites in such service. Improved equipment is a guarantee of continued efficient production at a price that is satisfactory to the consumer and which insures a reasonable profit to the producer.

* Manager of Sales, Frogs and Switches, Bethlehem Steel Company.

The ENGINEER in INDUSTRY

By G. H. BUCHER*

THE average person thinks of an engineer as one who is engaged in design and invention. However, we are rapidly broadening this conception in order to recognize the important function engineers perform in producing more goods at less cost and with less human effort. It is quite true that we could not progress without engineers and scientists engaged in research and invention; it is equally true that progress is dependent upon another class of engineers who put to work, for the benefit of all industry and finally for all men, the fundamental findings of research and invention.

Today, most plants are engaged in practical research of the type wherein engineers experiment not necessarily with delicate apparatus, retorts, and tubes, but rather with processes and methods; their eyes fixed on producing a better product for less money. This is particularly true in the mining industry.

A quality product is of primary importance, but quantity, uniformity, and low cost are essential and demand full knowledge and control of every step in production. Engineers have developed and adapted all sorts of instruments to meet these exacting requirements—instruments that measure the quantity of material, its temperature and rate of flow, power consumption, size, density, and sometimes even color. Chemical and physical properties are constantly and closely checked and recorded as a routine matter.

The toys of science have become every

* Executive Vice President, Westinghouse Electric & Manufacturing Company.

G. H. Bucher

day tools of industry. The X-Ray, which for years was thought of only in connection with the medical profession, is now used to detect hidden flaws in the raw material and finished products of industry. Automatic devices to control processes are everywhere in evidence.

Rewards swiftly follow the use of scientific methods and engineering control—greater recovery from raw materials, reduction of misapplied labor and waste of material, and the discovery and development of uses for material formerly wasted. The fines from coal become the fuel for pulzerized coal fired boilers and the discarded tin can a necessity for the leaching plants of the copper industry.

The molding and application of scientific achievements by clear thinking engineers is sound insurance for producing economically and adequately the needs of society.

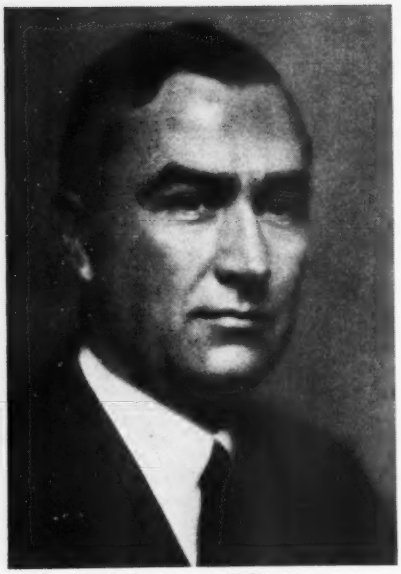
MECHANIZATION Serves Both LABOR and INDUSTRY

By ROBERT W. GILLISPIE*

THE RECORD of the machine in industry needs no apology. Since the machine transformed the United States into an industrial nation this record has been one of higher production, higher wages, and lower prices. Cyclical changes may have caused temporary recessions—but the general trend continues upward. Wage earners now receive a larger share of the national income than ever before. These higher wages are the result of greater production. The machine has given both and has added better living for good measure.

Machinery unquestionably has served the coal miner better than it has the worker in most industries. Before mine mechanization was begun 60 years ago,

* President, Jeffrey Mfg. Co.



Robert W. Gillispie

when the first practical cutter was introduced, mine labor was back-straining and most hazardous. But with the installation of new or improved machines, the mine-worker's job has become easier, safer, and better paid.

Advances made in coal cutting are typical of this development. Skilled as he was, the old Welsh miner had a time of it to cut a kerf with his hand pick. Then came the breast machine: it reduced the labor of kerfing, but still required considerable man power to bar it across the face. As a continuous cutting type of machine, the shortwall lessened the labor of cutting, but still had to be demounted from its truck for cutting and remounted for moving. Today we have the track-mounted cutting machine with enlarged reach, flexibility of adjustment, and finger-touch control. What is true of cutting also is true in greater or lesser degree of other operations in the mining cycle, as advances in machine design and performance have elevated skill above strong back.

Stemming the inroads of gas and oil, which are produced with little labor, the machine stands between the coal mining industry and disintegration. Without machinery, coal prices could be maintained at competitive levels only at the expense of the wage earner. Moreover, the machine has enabled the mining industry not only to regain lost markets but to create new ones.

This improvement must go on. Although introduction of the machine may result in some temporary displacement of labor, it compensates by making better wages possible, and also by holding out the only substantial promise for future additional employment at such wages. Increased mine employment actually can come only from expansion of markets, something which cannot be accomplished unless selling prices are kept at a point where they attract new uses and new users.

A return to the hand methods of 60 years ago, with consequent reduction in worker productivity, would mean only one of two things: either further shrinkage of markets and diminishing opportunities for employment; or substantial lowering of wage. Today's alternative, mechanization, is obviously preferable.

After all, mechanization is but the means of fulfilling an age-old desire to eliminate hard labor and to share more fully in the comforts of life.

A PARTNERSHIP in EFFICIENCY

By THOMAS McNALLY*

PROFIT and contingency margins are rapidly being reduced to the minimum in every industry and failure or survival often depends on narrow ranges of operating efficiency. The over-all efficiency of a coal mining organization is composed of many individual factors, any one of which may gravely disturb the total. Each operating department faces its own problems of gross production per man-hour of labor, per unit of power and fuel consumption and per dollar of expenditure for maintenance, repairs and supplies. Of equal or greater significance is the maximum recovery of marketable products from the raw material available in the seam. This embraces the actual mining of the greatest possible percentage of the seam, in satisfactory condition for the preparation facilities available, and the realization of maximum market values from the raw feed as mined. This latter involves not only the salable tonnage produced but its distribution between the more and less valuable products.

Mining practice is attaining a high degree of efficiency through years of experience and study on the part of many capable mining men. Nevertheless the major improvement from now on, especially in conservation of power and labor and in increased realization must come largely through using more and better machinery. The new problems are mechanical rather than mining and who is better fitted to solve them than the manufacturers of mining and preparation machinery? Large staffs of highly trained and widely experienced engineers are constantly engaged in study and research, designing new machines and arrangements and no one will deny that more than a little progress has been made in recent years.

In preparation plants, new developments in the application of anti-friction bearings, together with improved design and construction of conveyor chains and mechanical drives, have notably reduced power losses and maintenance costs. New automatic and mechanical devices applied to old and new operations, have greatly reduced manual labor in addition to insuring better and more uniform products. New design arrangements, coupled with late developments in electrical controls, signaling devices, etc., have further reduced man-hour requirements per ton of finished product.

Modern coal washing processes, by reason of increased sensitivity of regulation and automatic product control, deliver washed coal of higher and more uniform quality with less loss of fuel value in the rejects. The adaptation of mechanical cleaning to sizes as large as 8 in. has minimized and in many cases completely eliminated hand picking, further reducing labor costs. Crushing and retreating of laminated material or "middlings" increase the net yield without sacrifice of quality. Improved dewatering methods reduce washed coal moisture contents, providing more satisfactory products for shipping or reducing drying requirements where final thermal drying is necessary. Initial and operating costs of thermal drying have been considerably reduced and much additional research is being conducted.

Improved size reduction equipment breaks and crushes undesirable sizes down to more readily or more profitably marketable grades with a precision of control which puts a greater proportion into the more desirable grades than was possible with previous equipment. At the same time the increased accuracy and flexibility of sizing, crushing, dedusting, desludging and mixing provided by recent plant design, coupled with precise and almost instantaneous adjustment of washed coal quality literally make possible the loading of "tailor-made" coal, to exact specification as to size range, size distribution and analytical quality.

The salvage, for marketing separately or with washed slack, of the fine sludge formerly discarded, provides an additional increase in net yield and the improved equipment now available for recovering sulphur values from refuse further reduces the volume and value of the final waste material.

These developments have not been accomplished by either the coal industry or the manufacturers alone, but by their combined efforts. If the efficiency graph of the coal industry is to continue its upward climb this partnership must carry on.

* President, The McNally-Pittsburg Mfg. Co.

Solving Pumping Problems

The Diesel engine as a solution to many pumping problems is the subject of the booklet issued recently by the Caterpillar Tractor Co. The outstanding performance of these engines pumping for irrigation, running sand pumps, working on dredges, pumping for mines and pumping crude oil and gasoline has been pointed out by a series of excellent photographs and explanatory captions. The booklet deals briefly with pumping problems the world over and gives illustrations of Diesel engine performance both in the United States and abroad.

The Place of the MACHINE in PRODUCTION

By W. W. DARTNELL*

AS WE step into a new 1937 automobile and seat ourselves comfortably on an upholstered seat behind the wheel, turn the ignition lock key, press lightly on the foot accelerator, a flip of our finger throws in the automatic gear shift and, gently letting out on the clutch, we smoothly glide away in a car powered by an engine that can operate without mechanical difficulty a distance equal to several times around the world; but how many of us ever stop to realize, or even appreciate, the almost perfect mechanical device that man has produced. Only a very few people are aware of the vast amount of sacrificial effort that has been spent on experimental and research work, the engineering put forth by mechanical genii, the accuracy of the workmanship, or the vast resources available to build the modern day car.

As a former coal operator, little did I appreciate the efforts that have been put forth by the personnel of the manufacturers of mining equipment. Even with all the work that has been done by the mining machine manufacturers, the development of refinements in mechanical means of mining coal are still behind the progress made by some of the other industries. This can be partly accounted for by the depressed conditions, low wages until the last few years, and lack of the initial momentum toward mechanization. I believe that the initial momentum of mechanization of the mines has come, and that the trend towards complete mechanical mining of coal will continue uninterrupted.

In order to keep the coal industry alive and in competition with other sources of energies of fuel, it will be necessary to reduce the operating costs and maintain an even selling price in face of rising wages. The coal industry cannot afford to allow the costs to increase or the selling price to rise too high, but must hold them to their present level or possibly reduce them through the mechanical mining of coal.

Already we have felt the effects of the early stage of mechanization in the various departments of mining, such as new developments of tipple equipment, cleaning plants, ventilating fans, more powerful locomotives, underground conveyors, rubber-tired transportation equipment, loading machines, cutting machines, and a machine that will even cut and load the coal in one operation.

As an example, I will use the manufacturer of mining machines to show the amount of effort, both mental and physical, that is put forth to provide the mining industry with modern and improved coal-cutting-machine equipment. Just as the 1937 model automobile is far superior to anything we even dared to dream of in 1920, so the recent models of cutting machines have been improved. There was recently published a reprint of an advertisement by a leading automobile manufacturer, who in 1904 came forth with a blaring advertisement stating that it would be impossible to make any improvements in the future on their car, as he considered his the ultimate in automobile design and recommended that everybody buy that year's model, for there would never be any changes. This same representative would, no doubt, be fearful to make such a statement about the 1937 model.

The engineering departments of the manufacturers of mining machines have spent long hours in developing improvements in their equipment. Minute care is used in checking the strength of each and every piece that goes to make the final product. Ample allowances are made to provide safety factors that will take care of reasonably unexpected loads. The plans are continually checked and changed, to add improvements which have been recommended from actual service.

The research department is constantly analyzing the materials which are used in its manufacture, and experimenting and studying the knowledge of others, in order to provide new and better alloys.

Instead of heavy iron castings, we find that cast steel is used, in order to reduce the weight and increase the strength. In place of ordinary steel gearing and shafting, oil-treated modern alloy steel is used to furnish the maximum of strength. Lubrication of sleeve bearings by pouring oil from cans to open wells stuffed with waste has been replaced by anti-friction bearings lubricated by the splash oiling system. The oil is sealed into the gear case, so that no dirt can enter and contaminate the oil and increase the wear of the parts. In place of the old hand-lever controller, we find the push button, magnetic contactor with overload and short-circuit protection. The motors, instead of being wound with cotton-covered wire, are now all made with coils insulated with heat-resisting and moisture-proof material. The trucks which transport the cutting machines from place to place have been completely remodeled into faster, safer, and more flexible units.

The improvements which have taken place in the large track-mounted cutting machines have been such that the work that can be performed is uncanny and the speed of cutting unheard of until the last several years. Instead of using the unflexible mechanical power control of the cutting feed and other movements of the machine, it is now being done by the more flexible hydraulic power.

The demand for inexpensive, small cutting machines for conveyor mining has been recently supplied by the manufacture of a light-weight, low-horsepowered unit. This has been possible through the use of high-strength steel alloys, anti-friction bearings, and efficient electrical equipment.

The operating controls have been improved by centrally locating them, so that it is no longer necessary to use two men to operate levers scattered from one end of the machine to the other. The useful horsepower has been materially increased, and the cutting speed has been stepped up to, in some cases, double that of formerly equally powered machines.

All the aforesaid has tended to increase the costs of building the machines, but the manufacturer has kept one thing in mind, and that is the constant improvement of the quality of his product. By reasonable care in the use of the machines, the maintenance costs can be reduced over that of the old type machines. Twenty years ago a 1,000-mile trip by auto meant considerable preparation of the car before starting. Often interruptions from mechanical failures occurred on the journey and repairs were necessary at the end of the trip. Now we start out on a 1,000-mile trip with no thought of mechanical trouble, and we complain if we have a five-minute delay en route. At the end of the trip your automobile is again ready for another one of the same distance or even farther. In much the same way the new cutting machines are able to go through

(*Concluded on page* 74)

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EFFICIENCY at the FACE

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Coal Industry Turns to Modern High Capacity Equipment to Offset Shorter Hours and Higher Wages

By J. F. JOY*

OBSERVERS from the sidelines cannot help but recognize the progress that is being made by the coal mining industry in extricating itself from what seemed, but a few years ago, to be an almost hopeless situation. Much outside influence has, in the past few years, been brought to bear upon the various phases of coal production and distribution, with the objective of putting the business of coal mining on a more profitable basis. But after all, viewing the industry as a whole and from the outside, one is impressed by the individual effort that is being put forth by various operating companies for the purpose of reducing operating costs and increasing mine profits. The results are that today we find many companies operating under wage scales that provide for shorter hours and higher wages than existed but a few years ago, and doing so at a profit.

The situation that has confronted the coal industry for the past six or eight years has at last been recognized as one requiring leadership and courage, and, just as it always has been and always will be, leadership springs out of periods of adversity and subnormal conditions. Leadership in the coal industry, the same as any other human activity, can only arise out of the foresight to visualize the effect of trends upon the industry and the ability to formulate plans and measures with which to profit from those trends. The new leadership that has arisen in the coal industry possesses these attributes, with the result that effective measures are rapidly being taken to offset the increase in wage rates and shortening of working hours with which they now have to contend. Foresighted leaders have not only overcome these recently added burdens, but are even making additional inroads into markets formerly surrendered to competitive fuels such as oil, gas, and hydroelectric power. It will be interesting to note the procedure that has been followed by some of the outstanding organizations engaged in coal production. Upon analyzing their problems, they naturally turned to the use of machinery as the most logical means of offsetting the increased cost of man power; and, although mining machinery has been in use for more than a half century, it was at once recognized by many that available machines lacked capacity and, in many cases, suitable design to permit of performance to the degree demanded by the new day's requirements. They naturally turned to mining machinery manufacturers for relief. Manufacturers were quick to respond, with the result that there are available today at least a dozen new types of coal cutters, with several variations of almost every type, and all have capacities greatly in excess of those available but a few years ago. There are also several new and improved types of loading machines of high capacity and capable of operation under conditions that but a few years ago were considered impractical. Hundreds of miles of conveyors and other transporting me-

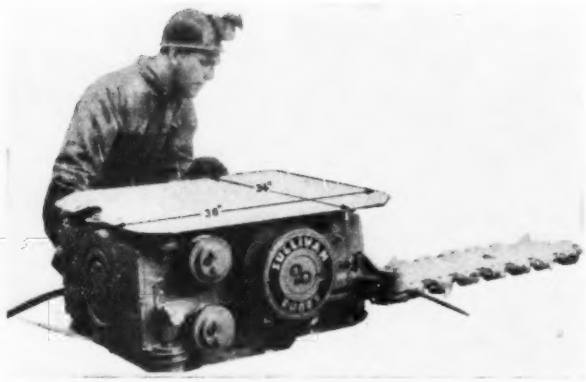


FIG. 1.—*Small-Dimensioned, Light-Weight Coal Cutter Especially Adapted to Conveyor Mining.*

FIG. 2.—*Modern, High-Capacity Shortwall Coal Cutter Carried by New and Up-to-Date Two-Speed Tramming Truck.*

* Manager, Mining Machinery Division, Sullivan Machinery Company.

diums have come into the picture, all for the purpose of reducing production costs and increasing operating profits.

In addition to these, there have recently appeared on the horizon machines designed to reduce the mining cycle to but a single operation. These new developments are directed to the removal of the coal from the solid seam and loading it into mine cars, or other transporting mediums, by the use of a single machine.

It is interesting to note that aside from the few aforementioned improvements in coal-loading machines, the major strides have been made by improvement in coal cutters, with the result that there is today a type of coal cutter available for most any conceivable mining condition. The widespread use of conveyors brought the demand for a small, compact, lightweight, low-cost machine that might be conveniently used in the restricted space common to conveyor operations and that can be economically assigned to a single working place. Figure 1 illustrates a machine adapted to these requirements. Although this small machine is a comparatively recent development, there are more than half a hundred in daily operation.

Mines which, by reason of adverse mining conditions or other specific requirements, were confined to the use of shortwall machines brought a demand for shortwall machines of increased capacity and greater dependability. Again it was found that loading machines had attained capacities beyond that of the older types of shortwalls, and as efficient loader operation depended largely upon coal cutters of equal capacity, more powerful and dependable shortwalls were needed to meet this situation. The more modern shortwalls embody dual-drum drives, high and low speed—both drums, drop-out safety type chain clutch, independent retarding clutches, underwinding rope drums, 25 percent more powerful motor, 35 to 40 percent more power in the cutter chain.

Along with the development of these higher capacity and more powerful shortwalls, attention has been given to the matter of improving self-propelled trucks. New and improved trucks are, therefore, now available in a form that very much expedites and simplifies tramming operations. Features that chiefly contribute to the more efficient performance of this equipment are two-speed, nonresistant tramming; independent forward and reverse gear, thus eliminating motor reversal; automatic truck coupling; automatic truck lock; vertical axis, all-direction winding cable reel; oil-immersed gearing and ball bearings. These most modern trucks are provided with an auxiliary deck for use in coiling the hand cable. Figure 2 is an example of one of the more modern shortwalls carried by the latest of tramming trucks.

The panel system of wall mining created a demand for a coal cutter that could be used to equal advantage for the driving of narrow development work, or for production work on walls. As result, there are now available machines of the dual duty type, capable of efficient performance under conditions to be met in wall-panel mining.

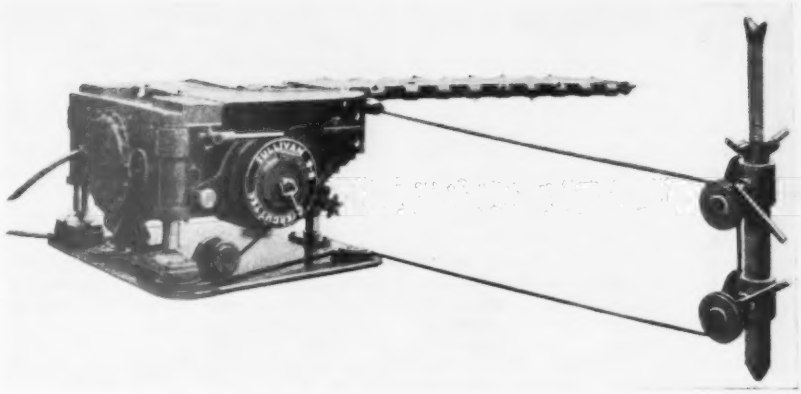


FIG. 3.—*An Hydraulically Adjusted Overcutter Provided with Bar Tilt and Roll.*

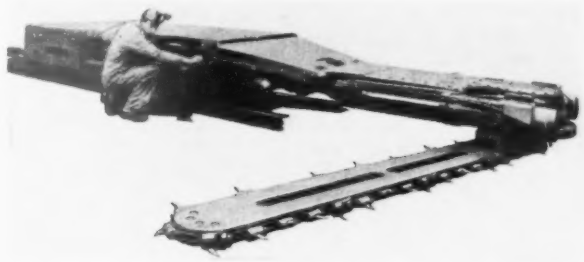


FIG. 4.—*A New Low-Vein Track Cutter for Use in Thin Seams or Under Conditions Requiring Timbers Being Carried Close to Face.*

In order to obtain better preparation in seams having underlying bands of dirt and bone, effective and efficient machines are now available of the floor type for cutting in the roof, or between the floor and roof, as the case may demand. Figure 3 is an example of one of the more modern types of adjustable overcutter. This machine has an overall length, less bar, of but 49 in., and provision is made for both roll and tilt of the bar, to enable it to follow irregularities of roof, or of bands of impurities common to many seams of coal.

The demand for faster and more powerful track cutters from large mines has brought about the creation of universal machines capable of making either horizontal or vertical cuts at any point between the roof and floor and within a radius of 21 ft. from center of track. This wide range and increased capacity simplifies track laying, particularly as regarding the turning of room necks and driving breakthrus. The more modern track cutters are equipped with responsive, smooth-flowing, hydraulic control, which permits of quick positioning and instantaneous adjustment.

The demand for track cutters from operations heretofore confined to the use of shortwalls, because of the close proximity of timbers to the face, has been met by a recently designed low-height machine. This machine has a double-jointed bar support which permits the movement of the cutter bar into a position between the timbers and face, without timber removal, even under conditions where timbers would need be removed to permit of shortwall operation. Figure 4 is an example of this most modern type of track cutter.

All of the machines herein mentioned are relatively new, none more than two years old, and the remarkable thing about it is that regardless of their newness, most all of the types mentioned are now in daily use in the principal coal fields. This is rather definite proof that progressive operators are turning to modern, high-capacity coal cutters as a means of offsetting the increased wage rates and shorter working hours that the dawn of a new day has brought to the coal industry.

SAFETY in Lump Coal Production

By H. I. PHEMISTER*

THE necessity of maintaining a good safety record in coal production has given rise to a definite change in the methods originally employed to dislodge coal.

In past years, when coal production was low and mining machines were in

* American Cyanamid & Chemical Co.

their infancy, black powder and high explosives were almost the sole means of breaking down the coal after it had been mined by hand. With the advent of mining machinery, mines were developed at a greater rate, new territories were opened, and changing mining conditions were encountered daily.

In 1907 over 600 men lost their lives from dust and gas explosions traced to the use of nonpermissible explosives. As a result of these disastrous explosions, the Bureau of Mines was set up by Congress to determine by test those explosives suitable for use in gassy coal mines, these explosives to be called permissible explosives. The Bureau of Mines maintains a staff of engineers who continually strive to obtain and disseminate information relative to greater safety in explosives along with the actual testing of explosives that are submitted by the explosives manufacturers.

A permissible explosive is designated as one that is similar in all respects to the sample that has passed certain tests outlined by the U. S. Bureau of Mines. The salient points are that the charge can be fired by an electric detonator not less efficient than a No. 6; that 1½ lb. of a charge shall not produce more than 5½ cu. ft. of poisonous gas; and that a like charge will not cause an explosion when shot unconfined into a gallery containing a 4 percent mixture of air and Methane gas and having coal dust present on shelves in the gallery and also in suspension.

The manufacturers of explosives entered into the new field of research with the utmost of cooperation, realizing that such a development would entail large expenditures from a manufacturing standpoint, as well as sales expense, as the consumers of explosives had to be educated to the proper use of a new blasting agent. By the end of the first year less than 20 permissible explosives had been approved by the Bureau of Mines. Since that time 675 different samples of explosives have been submitted for test and over 400 have passed the prescribed tests. At present, 173 permissibles are on the active list.

Explosives research chemists are constantly on the search for new materials for use in permissible explosives and are continually improving the quality of the product offered to the consumer. Problems such as sensitiveness and storage qualities are often unthought of by the consumer, yet they are a few of the important problems that the manufacturer confronts, and it is only through the untiring efforts of the manufacturers' research chemists that it is possible to purchase a product whose performance can be predetermined regardless of the temperatures at which the explosive is used.

There has been a rapid increase in the amount of permissible explosives being used in coal mines today. In 1936, 47,001,614 lb. of permissible explosives were used in coal mining against 2,842,450 25-lb. units of grain or pellet powder, whereas in 1935, 38,665,149 lb. of permissible explosives and 2,464,289 25-lb. units of grain or pellet powder were used. This gives an increase of 8,336,464 lb. of permissible explosives.

Permissible explosives are offered in grades varying from 92 to 264 1-1/4x8-in. cartridges per 50-lb. case, and with rates of detonation varying from 4,200 ft. per second to 15,800 ft. per second. It will be noted that a very wide range of strength and speed characteristics are available in the present-day permissible explosives.

The recent drive by some state mine departments to eliminate grain and pellet powder from coal mines has centered much attention upon the results that are obtainable from the use of the correct grade of permissible explosives. During the past 6 months one state has practically abolished the use of grain and pellet powder from underground coal mine operations. Very favorable results have been reported by the coal mine operations as to the grade or percentage of prepared sizes that have been obtained from permissible explosives. Reports are frequent that after the miners were thoroughly trained in the proper use of permissible explosives the slack percentage had returned to the figure previously enjoyed when black or pellet powder was used. The added safety from the use of permissible explosives is of such great importance and so well known to every consumer of explosives underground that mention herein is unnecessary.

The recent demand for clean coal has forced consideration of means of producing lump coal. It is a well-established fact that in order to produce clean coal without the aid of cleaning plants the coal should be as coarse as possible, as there is a limit to how small a size of impurities a miner can reject at the face. Also, the amount of impurities rejected at the face cuts down the tonnage of refuse that must be transported outside and passed through the cleaning plants. This change to lump coal has necessitated the development of a series of lump coal producing permissibles.

The consumer of explosives has for his consideration a series of explosives varying in cartridge counts from 115 to 255—1¼ x 8-in. cartridges per 50-lb. case, with rates of detonation of between 4,200 ft. and 6,000 ft. Permissible explosives with this low rate of detonation, when properly used, will produce prepared sizes which compare favorably with grain and pellet powder, and in some types of coal will exceed the performance of the black powder and pellet powder.

The proper explosive for a given mine operation may vary considerably for any specific vein, as such paramount factors as local impurities, method of cutting, or method of loading play an important part in the selection of a proper grade.

The manufacturers of explosives maintain a staff of mining engineers who are thoroughly trained in the manufacture of explosives and in their proper use. This service is offered to the consumer of explosives free of charge, and considerable money has been saved by the consumers of explosives through the cooperation offered by the service departments of explosives companies.

The manufacturers of explosives exert an untiring effort to offer the consumers of explosives the greatest safety known to present day science. It must be borne in mind that although a permissible explosive is employed as the blasting agent, unless it is used correctly and in accordance with the prescribed methods as given by the Bureau of Mines, the hazards of explosions are not entirely eliminated from the operation, and that only through the cooperation of the mine management can the safety, possible in the use of permissible explosives, be assured.

Modern Methods in BREAKING DOWN COAL

By N. CHRISTENSEN*

THE non-explosive mining method is an improved method of dislodging coal at the working face without smoke, flame, noxious fumes or explosion, utilizing the slow heaving action of expanding carbon dioxide gas. The idea was conceived some 15 years ago. The original cartridge was a cumbersome thing of four-in. diameter, weighing over 90 pounds and contained over 50 parts. Special drilling equipment was then necessary and a 75 ampere current at high voltage was required to ignite the heating element. Contrast this with the low pressure Cardox of today, with cartridges of various sizes and weights ranging from only 10 to 40 pounds, with but 15 parts, and can be released by a fraction of an ampere at only two or three volts. It is non-inflammable and non-explosive. It is inert and will not burn or support combustion. Equally important, carbon dioxide is non-poisonous. It is the same gas that is used in fire extinguishers and is the gas that puts the sparkle in beverages and is used in making dry ice. In fact it has many important uses in connection with the practices of medicine and surgery.

The cartridge consists of a hollow tube forged of chrome-molybdenum steel, capable of withstanding internal pressures up to 40,000 pounds per square inch. Into one end of the cartridge is threaded the charging cap, and into the other end is threaded the discharge cap. After a heating element has been inserted, liquid carbon dioxide is pumped through a valve in the charging cap. There are two electric terminals in this cap for connecting the shot firing cables to an electric squib in the heater element.

The discharge cap is equipped with angle ports through which the expanding carbon dioxide is released at discharge.

* Safety Mining Company.

These ports are so constructed that they hold the cartridge to the back of the drill hole. A soft steel shearing disc seals the carbon dioxide in the cartridge until the predetermined discharge pressure is reached. The principle of the method may be likened to that of a boiler with one weak plate. Steam, generated within the boiler, upon reaching a given pressure would rupture the plate and blow out. By varying the thickness of the weak plate and the quantity of steam, both the force, i.e., the pressure of the blow and the radius of its effect, could be varied. In a similar way it employs carbon dioxide as its energetic force.

When current is applied to the terminals in the charging cap, the electric squib sets off the chemicals in the heater and sufficient heat is generated to instantly gasify the carbon dioxide, increasing the pressure within the cartridge. As the gas in the cartridge reaches the predetermined discharge pressure, the shearing disc gives way, and the gas is released through the ports.

After the cartridge has been discharged, it is returned to the charging plant. At the charging plant the disc and heater are replaced, and the cartridge is recharged and returned to the face for repeated use. It is used over and over again.

The disruptive force can be accurately controlled to meet the requirements of any particular coal. Two factors determine the extent of this force—the volume of carbon dioxide and the discharge pressure. The discharge pressure determines the breaking force of the blow delivered, while the volume of carbon dioxide determines the radius of action.

Both of these variables can be adjusted to suit individual mine conditions. The discharge pressure can be changed by varying the thickness of the shearing disc and the size of the heater element. The discharge volume can be changed by varying the amount of carbon dioxide. Once these adjustments have been made, they remain fixed and can be changed only by the management. This makes for uniformity in preparation and is a guard against overshooting.

Breaking down the coal involves no radically new procedure. The operations are practically identical to those necessary in mining coal with explosives. Undercutting and drilling are in the usual manner; however, Cardox is a tamping within itself and, while tamping is recommended, a number of the larger producers do no tamping whatever.

Charged cartridges are customarily sent out from the charging plant on empty mine cars, and the discharged cartridges are returned in the same manner or upon loaded cars. Cartridges are delivered to a central point, and from there usually handled by the men in charge of face preparation. In this manner they are handled without difficulty and with a minimum of lost time. There are no hazards in the handling of the cartridge.

Low pressure Cardox has an average discharge pressure of less than 15,000 lb. per sq. in., and produces a slow heaving action. Just as expanding steam in a steam engine cylinder produces a slow steady push on the piston, expanding carbon dioxide from the cartridge maintains a slow but steady push on the coal at the working face. There is no detonation to unnecessarily destroy the coal structure.

Because of the absence of smoke and fumes, and the ability to shoot at any time, it may play an important part in the speeding up of development work. The coal face can be broken down two, three or even more times per day, just as often as men or machines can load out the falls.

Where an increase in tonnage is desired, a given number of men and equipment can increase their output very materially. Where no increase in tonnage is desired, fewer faces can be worked, thus reducing the necessary ventilation, haulage, timbering and supplies and simplifying supervision. With mechanized mining, it makes possible a continuous operation at the working face. There is no interference with the operating cycle. Crew and machines are utilized to full capacities. Idle time is eliminated and production costs per ton of output are lowered.

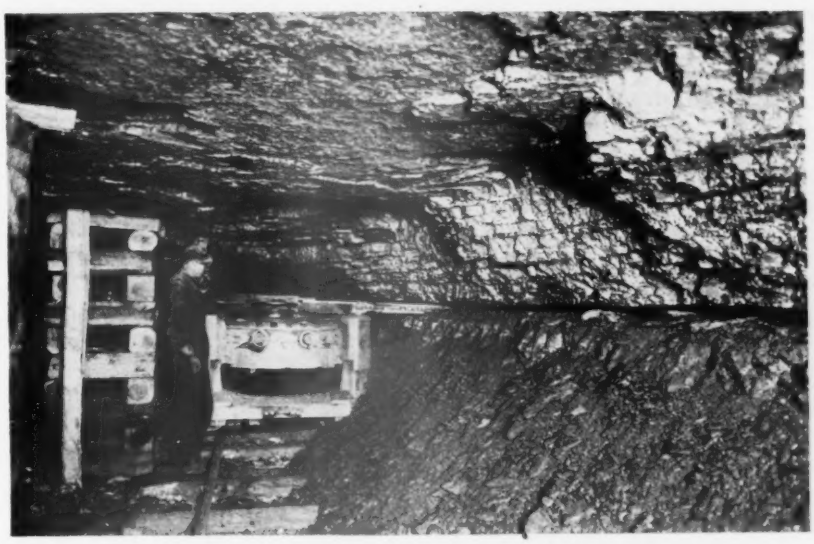
Hand loaders may be able to pick down the brow that remains standing without running costs too high, but for maximum economy with mechanical loading, the entire fall must be brought down free of the face.

The cartridge releases a large volume of gas at low pressure. The force of the expansion is concentrated at the back of the drill hole instead of along the entire length of the charge, heaving the coal forward. This heaving action shears the ribs and top or bottom clean, and rolls the coal forward from the face to where it can be readily loaded out by machines.

Where coal is left standing or where the loading machine must dig into a hanging face, the machine cannot operate efficiently. Its progress is slow and it may even have to remain idle while the face is hand picked.

This delays production, ties up both the machine and crew, reduces tonnage and greatly increases maintenance and production costs.

Regardless of the method of mining, Cardox produces a firm structured coal that suffers a minimum in degradation. It not only produces a maximum of coarse and a minimum of fine sizes, but practically eliminates the dust, making for a better preparation and reducing mine hazards. The slow expanding force and gentle action will preserve the roof and leave the coal face and ribs firm and shatterless.



CONVEYOR MINING Is Successful

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SHORTWALL MACHINES for Conveyor Mining

By L. F. CRAWFORD*

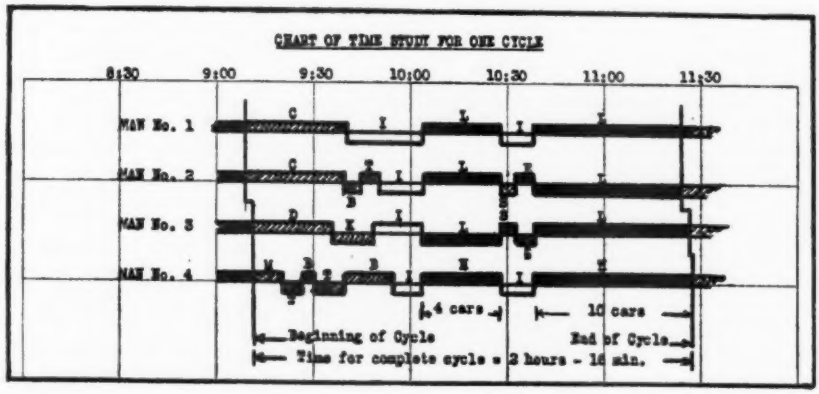
THIS article discusses the application of conveyor mining to flat seams of coal 48 in. to 18 in. in thickness. The science of the application of conveyors for the mining of coal is a broad subject and is really a system of mining in which not only the conveyors but also the cutting machines, drills, gathering conveyors, method of ventilation and the mine cars are important parts of the system. The correct choice of all of this equipment to properly fit a particular physical condition for the mining of coal will be the deciding factor in the success of the installation.

In order to open the subject of the proper application of shortwall machines to conveyor mining and the proper design of these machines relating to dimensions, functioning and ease of handling in this work, the first thing to consider is the system of mining prevailing and the physical conditions encountered in the mines in the coal fields of the United States.

Broadly stated, to apply conveyor mining with the expectation of reducing costs as against the cost of loading coal into the mine car, a good quality of top is an important factor and this is particularly true in the seams of coal 3 ft. and under in thickness. The range of height or thickness of the flat seams of coal which will use conveyor mining is to be considered next and this range is normally from 48 in. in height down to as low as 18 in. in height. However, in the mining of bituminous coal there are few successful operating properties in seams of coal under 26 in. in height and these few are in particular fields for a particular reason. Thus the large percentage of coal mines to which conveyors will be applied is in excess of 30 in. in height This statement does not apply to mines having pitching seams or flat thick seams with special top conditions.

With the system of room and pillar mining prevailing in the United States, both in pitching as well as level seams, all the different conditions under which a shortwall machine has to do its work must be considered, that is in narrow places, wide places, cutting across the pitch, cutting up and down the pitch, cutting in advance work and also retreat work.

When all of these conditions are studied the first thing that is noticed is that the designers of these machines are confronted with space limitations and dimensions of machines, which past experiences have set up as standards and limitations.



SUMMARY FOR ONE CYCLE

Key to chart	*Man minutes*	*Percent*	*Notes*
C—Cutting	62	11.4	Shortwall—5½′ bar
K—Cleaning kerf	13	2.4	Room width—23′
D—Drilling	25	4.6	Electric hand drill
B—Blasting—tamping	22	4.1	4 holes
T—Timbering	21	4.0	3 posts
P—Picking slate	...	...	42″ coal—no partings
L—Loading at face	213	39.3	18 tons—14 cars
H—Car trimming	74	13.4	Electric hoist
S—Supplies to face	8	1.5	.....
E—Extending conveyors	12	2.2	Chain type
R—Repairs	...	...	.....
M—Miscellaneous	11	2.0	.....
I—Idle	82	15.1	Smoke clearing, etc.
Total	543	100.0	

* Goodman Mfg. Co.

In the application of shortwalls to mining, two types of machines are required with relation to height. Thus it will be seen that in the standard machines the endeavor has been to keep the height of the machine as low as possible and also make the length of the machine as short as possible. In application of low vein types, inasmuch as minimum height is stressed with a narrow range of dimensions for width, the study of the maximum allowable length becomes important if a machine is to be constructed which will fulfill all the requirements of functioning and ease of handling demanded of it.

In applying shortwall machines to conveyor mining, it is important to know the cycle of the time of undercutting as compared to other work to be done. In order to explain I have attached a chart made by Mr. McCarthy of a time study for one complete cycle for conveyor mining of the Clearfield Bituminous Coal Corporation, in 39-in. coal.

The time of undercutting was 11.4 percent of the total time cycle. If, however, this coal had been 26 in. high with the same undercut as made in the 39-in. seam, this percentage of time ratio would change and the time of cutting to that of the loading and the other duties would increase. Thus it will be seen that as conveyor mining progresses, these extremely low seams will force the use of longer cutter bars and new practices in the shooting of the coal and will also tend toward a faster cutting rate.

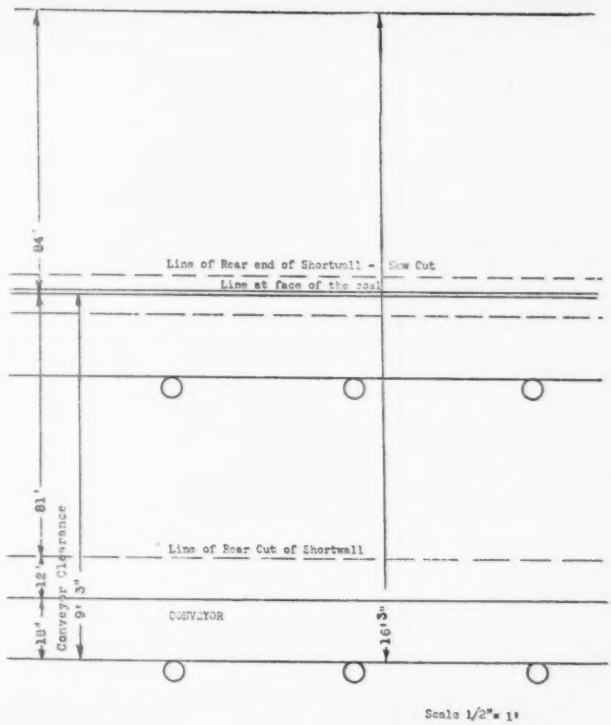
Inasmuch as these seams are thin and the clearance as to height is limited for the shortwall machines cutting in them, it becomes highly important to have a machine which will always cut on the bottom, therefore, a tilting device becomes of great importance.

Delay periods chargeable to the machine must be eliminated. Conveyor mining, to make a profit for the operator and also to make a profit for the labor employed in it, over and above the system of loading in the mine car, must utilize all the delay periods which are a part of the system of loading into the mine car.

The importance of roof control on work which is progressing rapidly on retreat which is double or triple shifted, and also the importance of the extraction of the timbers to insure this control are well known. The advantages of equipment with low maintenance is also obvious.

In the use of a low vein shortwall, whether in conveyor mining or loading into a mine car, the depth of the undercut governs the allowable length of the body of the shortwall machine itself. Modern practice requires deep cuts. In thin seams of coal this means thin kerf cutter bars.

The diagram shown herewith shows a conveyor set-up and an undercut with a machine 84 in. long, the undercut being 7 ft. deep. The distance from the face of the coal to the line of the posting back of the conveyors would be, allowing 12-in. clearance between the back end of the machine and the conveyor and a conveyor line 18 in. wide, 9 ft. 6 in. If this machine were 10 in. longer the distance would be 10 ft. 4 in.



Scale 1/2" = 1'

If the top is sufficiently tender to require now and again some posting, the posts would normally be set half way or even closer to the face of this distance of 9 ft. 6 in., which would be about 4 ft. 6 in. If the machine were 10 in. longer this distance would be about 5 ft.

If this top was truly bad top from the standpoint of a number of inches of persistent and heavy bone coal or draw slate, then the total distance from the back of the undercut to the posting back of the conveyor line in thin seams would apply, and, therefore, the important posts set would be very near to the face. This condition actually exists in the majority of cases.

Now if to undercut the place, posts have to be reset, and if to move up the conveyor line without tearing it down posts have to be reset or the conveyor line torn down and reassembled, one can see that the time cycle of cutting and moving up the conveyor may be, especially in these extremely thin seams of coal, out of all proportion.

How Seymour Mine Organized for MECHANIZED LOADING

By EDWIN H. JOHNSON*

THE Freeman Coal Mining Company installed their first loader of the L-400 type in the summer of 1936 at Bobby Dick mine and later in the fall put one in the Seymour mine at Herrin.

The Seymour mine suffers some of the handicaps of older shaft mines in that field, in that the shaft is small and the gage is narrow, thus restricting the dimensions of the mine car to one that is short, narrow and high. This is far from ideal from a machine loading standpoint; especially since the mining conditions are otherwise favorable to mechanization.

The coal is the Illinois No. 6 bed with about seven feet minable, leaving some top and bottom coal. Rooms are 24 feet wide on 45-foot centers. One row of posts on each side of the room track is all that is generally required. The standard Illinois panel system of mining is used with rooms turned each way from the panel entries.

To overcome the handicap of small mine cars the loader was provided with a discharge conveyor long enough to permit loading two cars for each shift by the gathering locomotive.

The coal is cut with Jeffrey 29-LE machines which make an undercut and center shear 7½ feet average in depth. Jeffrey A-6 post mounted drills, moved from place to place on a light four-wheeled truck, drill five or six holes in each 24-foot room and five holes in a 15-foot entry or cross cut. Local gath-

* Manager, Loading Machine Division, Jeffrey Mfg. Co.

Loading Out Standing Coal, Seymour Mine.

ering is done by storage battery motors which handle four or six cars at a time behind the loaders.

The average mine car capacity with machine loading is 2.49 tons each. Thus a single shift for the motor loading two cars will account for nearly five tons of coal. The time required to make a change of cars by setting out loads at the first crosscut and returning empties to the face averages slightly less than one minute. When only one gathering motor is used, however, the motorman has to take his loads out to the entry and bring empties back. The result of the time expended in this longer move is an increase in the average time of making car changes to more than two minutes per change.

The loader operation was started with one gathering locomotive during the period when the crews were being trained. The training of crews involved not only the loader operators and the gathering crew but others involved in the work. Primarily the education of the supervisory groups including foreman and face bosses is most essential; and that, in this case, was unusually successful. The track standards, the power distribution, the drilling and blasting and the timbering were gradually brought into line; and the tonnage grew from 300 to 400 per shift with two-shift operation. There were occasional higher tonnages reaching a peak of 501 tons on a day when everything went smoothly without delays. But the average capacity with a single gathering unit proved to be about 150 to 165 cars in seven hours.

This output represented 100 percent efficiency for the gathering locomotive but was only about 70 percent of the capacity of the cutting and shearing machine. It was realized also that the loader could readily handle a larger output if less time were lost shifting cars.

An attempt to test out this added capacity was made in March this year, by putting a second storage battery locomotive in service behind the machine. For the first five hours of the first shift the loader averaged 101 tons per hour, or 41 mine cars. Delays on the haulage accounted for 44 minutes of the last two hours of the day and 53 mine cars were loaded in the last two hours; the totals for the shift being 257 cars and 640 tons. Another similar run was made a few days later on the night shift with another crew. This resulted in an output of seven cars additional and 18 tons more than the day-shift record.

The effect of these tests was a study of their results which had the effect of changing the plans entirely for the further mechanization of the mine. The plan of the management is now to establish a daily average of 550 to 600 tons per loader and per cutter; and one-half of this amount for the drill crew and the gathering locomotive. The crew organization required for this output will be about as follows:

Two cutters, two loaders, two timbermen, four trackmen, four drillers and shooters, two motormen, two trip riders and one boss.

The output per man shift for coal delivered on the sidetrack on this basis is about 30 tons per man. This is being equalled in other mines, but is somewhat remarkable in view of the original handicap of a small shaft as earlier mentioned.

ROOM BELTS

By C R.. CLAGHORN*

EACH type of room conveyor—belt, shaker or chain, has advantages and disadvantages. To properly evaluate these, it is necessary to know the conditions under which they will operate. Each type will probably give the best service under a particular set of conditions.

* Goodman Mfg. Co.

The advantages of a belt conveyor for rooms may be summarized as follows:

1. Low power consumption.
2. Ability to operate at longer lengths.
3. Quiet operation.
4. Instantly reversible.
5. Largest capacity for minimum weights.
6. Ability to operate on adverse gradients, over or through sags, swales, etc., without loss of capacity.
7. Ease of extension or retraction.
8. Composed mostly of small light pieces, easily handled in moving from one set-up to another.
9. Variation in voltage, such as occurs in nearly all mines, has but little effect on operation.
10. Can be arranged for quick extension.

Following is a brief analysis of the points set forth in the foregoing summary:

1. Roughly, the power consumption may be taken for level conditions at 1 hp. per 100 ft. of conveyor with a rated capacity of 40 to 50 tons per hour. This is materially less than the corresponding power consumption for either shaker or chain conveyors. As the power consumed is a direct charge against the cost of coal production, this is a point in favor of the belt type, and is more of an object where power is purchased.

2. It is entirely practical to extend the usual room belt unit up to 500 or 600 ft. or even longer. This has a most important bearing on the cost of "moving" from one room to another, and the moving of the entire equipment, where a gathering belt is used, from one panel to another; 500-ft. rooms are quite "normal" for belt units—in the near future the same may be said of 600-ft. rooms. Other types of suitable conveyors are limited to about 300 ft. unless very heavy and costly equipment is installed. On this basis moves from one room to another are required three-fifths as often. A typical room conveyor installation may be expected to show an advance of two cuts per shift—if the room is narrow this may increase to three cuts per shift. Thus, if the panel is triple shifted, the life of a 300-ft. room is only eight and one-third days, whereas if the rooms are driven 500 ft. the room life on the same basis is increased to 14 days, and so also if the "moving" cost per ton for a 300-ft. room is taken at .018 cent it will be reduced to .01 cent for a 500-ft. room.

When gathering belts are used the panel life is affected in the same proportion. "Panel life" is more important than "room life" because of the heavy investment tied up in panel entry yardage on the gathering belt itself. The cost of knocking it down, moving to another panel and setting it up again is a direct charge against the cost of coal, in addition to the time and tonnage lost during this moving period. A typical example might be stated as a 1,500-ft. two-sided gathering belt panel—with either 300 or 500-ft. rooms on each side—say the rooms are 75 ft. on 100-ft. centers as at Stonega—two rooms being

worked as pairs on each side—the panel life would be only 62½ days for 300-ft. rooms against 105 days for 500-ft. rooms. In the one case an area of 1,500 by 600 ft. would be mined per panel life set up as against 1,500 by 1,000.

3. Quietness of operation is an important safety factor under some roof conditions. A well set up belt conveyor must be touched, if in the dark, to tell if it is in operation.

4. There is enough stretch in the belt to permit instant reversal of operating direction without adjusting tension. Ability to reverse a room unit is an important economy in sending timber supplies and extensions used at the face. Frequently men are permitted to ride the belt thus reducing the effort of traveling in low coal. There is now an appliance which prevents either men or supplies being carried beyond their destination.

5. Within certain limits the capacity of a room belt unit may be regulated by the belt speed since capacity is directly proportional to belt speed.

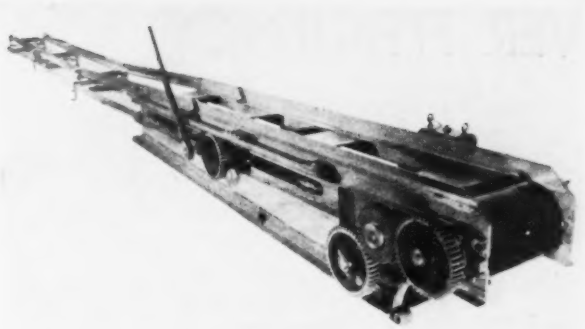
6. The action of a belt conveyor is positive. Adverse gradients, swales or sags have no effect on capacity, so long as belt speed is kept uniform. The load on a belt tends to hold it in place and keep it from lifting through swales. When the chains of a chain unit lifts, fine coal filters through and prevents the return of the chain to the pans and the chain has a tendency to ride out of the pan. To avoid this where gradients are very uneven, "hold-down strips" are used to hold down the chain. These strips increase weights to be handled, power to operate and first cost.

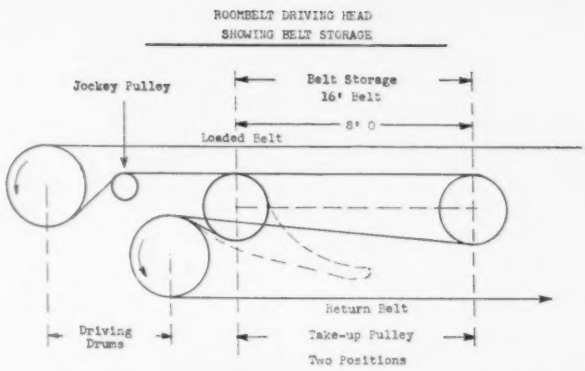
7. Flat belts, using "barn door hinge" fasteners are easily disconnected into convenient sections. The stands for the intermediate run are easily inserted between the upper and lower belt strands, so that where belt storage is provided by a loop "take up"—all insertion of belting is made in the upper stand at the driving head end, while intermediate stands are being inserted at the return end. The two operations are performed simultaneously with loss of but little time. A room belt conveyor was extended 12 ft. (after having taken two cuts) and 24 ft. of belt inserted in eight minutes.

8. The intermediate run of a room belt unit is composed of relatively light pieces—the heaviest weighing some 30 lbs. These are proportioned so they may be carried in or out on the unit. The belting itself is usually cut in 75-ft. pieces which weigh about 300 lbs. and are rolled up and handled about like a barrel.

9. Varying voltage has little effect on belt conveyor operation. It may run slow with low voltage and fast with high voltage. But there is no danger of its either transporting nothing at one period and tearing itself to pieces the next, due to violent fluctuation in voltage, which is the curse of many mines, especially the smaller ones.

10. By far the most important facility of a room belt unit is the possibility of incorporating a surplus belt storage device in the driving head. This device is operated by a rack and pinion of sufficient length to store 16 ft. of belt (or 8 ft. of conveyor). This is sufficient to take care of a 6-ft. cut and allow a margin for tensioning the belt. This device permits the receiving end to be placed in the most advantageous position with respect to the room face as the belt is tensioned at the driving head and the unit is not extended in fixed lengths. If properly started off with belt storage full and telescopic section closed—one cut extension is made without inserting belt by merely slacking off belt tension and pulling back tail end, thus opening the telescopic section time, two minutes. On the next cut 24 ft. of belt, and two intermediate stands, are inserted when the operation can be repeated. This belt is inserted each second cut only. Usually the tail end is pulled back by the cutting machine stabled close by using its cable.





One of the disadvantages of room belt conveyors frequently cited is "initial investment" or first cost. In the past this may have been the case, but superior manufacturing facilities and modification of design may partially overcome this factor. However, first cost appeals only to the inexperienced. Those with wider vision give more consideration to operating results. In hand loading to conveyors, the only paying operation is "loading" itself. Every other operation is "overhead" and, of course, to be reduced to a minimum. Time saved here and there, in these overhead operations, by superior facilities, each small in itself, often add up to several cents per ton. In the illustrations, one view shows a room belt driving head, with its double driven drums (permitting conveyor operation up to 1100 ft.) and the rack and pinion device for slacking off stored belt and tensioning the unit.

The other view shows the belt "wrap" around the driving drum and the movable take-up pulley with the take-up "loop" of surplus belt forming the belt storage.

Improved Compressor Units for General Service

An improved line of tank-mounted compressor units for general industrial service has been developed by Worthington Pump and Machinery Corporation, Harrison, N. J.

Single-stage units are available with vertical compressors. The motor sizes range from ¼ to 5 hp., with displacements from 1.43 to 67 cu. ft. per minute at a maximum pressure of 250 lb. per square inch.

Two-stage units are available with angle-type compressors. The motor sizes range from ¾ to 10 hp., with displacements from 3.9 to 45 cu. ft. per minute at a maximum pressure of 250 lb. per square inch.

A pressure switch, with a valve for unloading the compressor when starting or stopping, is furnished on all models. All units are equipped with Worthington feather valves. The crankshaft is carefully balanced to insure smooth operation. Full-floating wrist pins provide durability and quietness. The honed cylinder walls reduce friction and increase the life of the piston rings. Most models are available with either vertical or horizontal tanks (air receivers).

Simplicity of design, compactness, and attractive appearance have been especially considered in these units.

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Portable SUBSTATIONS

By F. P. BRIGHTMAN*

GOOD voltage regulation at the motor terminals and low power losses in the distribution system are essential to satisfactory and profitable operation of the modern mine. The location of substations for converting the high tension A. C. power supply into direct current for the mine power system is a major problem in laying out any mine power distribution system, because if the above requirements of good voltage and low losses are to be met, means must be found to overcome the handicap of a receding load center. This problem is particularly acute in coal mines using mechanized mining methods, because under that system load centers shift much more rapidly than under hand mining, but it is also present in other types of mine where the operations are of such a nature that the center of the load shifts frequently.

The majority of motors driving underground mining equipment are 275 or 550 volts d.c. A d.c. motor will keep on running long after the corresponding a.c. equipment has stalled because of low voltage, but when so doing it is operating at a disadvantage and among other things the output suffers accordingly, because the speed of the average d.c. motor drops approximately in proportion to the drop in voltage. A voltage drop of 40 to 50 percent would mean a corresponding reduction in the speed of the machines and consequently in the output. Such a voltage drop sounds ridiculous, but such conditions actually do exist in remote sections of mines that are spread over considerable areas.

When a well-planned and correctly-located substation is first installed, the d.c. voltage is good, but inevitably the working face and load center recedes farther and farther from the substation as the material is taken out. The power feeders have to be correspondingly lengthened to reach the motors, and eventually a condition is reached which requires heavy reinforcing of the feeder cables, relocation of the substation nearer the new load center, or a new substation supplementing the original installation, if a reasonably good voltage is to be maintained at the motor terminals.

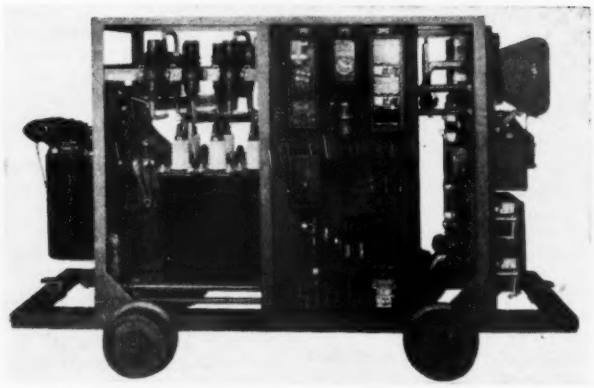


FIG. 2.—*Portable Full Automatic Switching Equipment for a Full Voltage Started Motor-Generator Set.*

Either of the above procedures takes time and money and may interfere with production, particularly if a substation is moved. Even though the cables are reinforced, there is certain to be a considerable power loss in the combined outgoing and return feeder circuit, which increases as the length of the feeder is increased. The k.w. loss equals the amperes squared times the resistance of the total length of circuit, divided by 1,000.

As an example, consider a 300-k.w. substation supplied with 2,300-volt, 3-phase, 60-cycle, a.c. power and delivering 275 volts d.c. to a load center approximately 4,000 feet from the substation. The a.c. incoming line consists of a 3-conductor No. 2 A. W. G. cable and the d.c. feeder circuit consists of a 1,250,000 c.m. positive cable with rail return. Assume that the rail is well bonded and that the resistance is equal to that of the positive feeder cable. With a load factor of 50 percent for a 10-hour period, the total power loss is 205 k.w. hours, which at 1 cent per k.w. hour costs $2.05. If the load factor is 75 percent and the average load, therefore, 240 k.w. (820 amperes), the loss would amount to $4.45.

Coupled with the power loss is a drop of 38 volts at 50 percent load and 57 volts at 75 percent load. This voltage drop means a corresponding reduction in speed of the mining machine, although it does not necessarily follow that there will be a corresponding reduction in output since there is usually some machine idle time which would have to be averaged up with the speed loss. It is not at all uncommon for loads of 150 percent to be on for considerable periods and then the voltage will drop to roughly 152. Obviously motors can not be expected to operate satisfactorily under such conditions.

* General Electric Company.

The only solution to the problem after the feeder cable has been reinforced as much as is economically feasible is to move the substation or install a new one. The former procedure is usually preferable, however, as the total amount of power required in the mine has not necessarily been increased and therefore, the addition of a new substation would be uneconomical unless the extra power could be justified on the grounds of reserve capacity. Under the conditions of the example given above, if the substation were moved to the new load center so that the long run was made by the 2,300 volt instead of the high current d.c. feeders, the power loss at 75 percent load on a 300-k.w. system would be approximately 15 cents for a 10-hour day. The voltage drop would be negligible (approximately 1 percent).

Portable substations designed to permit of easy and inexpensive moving so as to meet the needs of mining operations with rapidly shifting load centers can be obtained from the equipment manufacturers at a very moderate increase in cost over that of conventional stationary equipment. The entire substation is mounted on trucks of suitable track gage, and sufficiently low head room over the rails to permit of taking it almost anywhere in the main entries of most mines.

Motor generator sets, synchronous converters or mercury arc rectifiers with manual, partial automatic or full automatic control equipment can be arranged for portable service. The trucks are self-supporting with mine-car type wheels. The bases of rotating machines are built of extra heavy structural steel welded together to form a base which is rigid and self-supporting so that the machines can be operated standing on the wheels without blocking other than to prevent movement along the track. The substation track must be carefully leveled and ballasted as otherwise it might become uneven and cause the rotating parts to press against the bearings, resulting in a thrust effect which the latter are not intended to stand. The base is stiff enough to prevent bending but it can not prevent tipping if the track is uneven.

The synchronous motor generator set shown in Fig. 1 is rated 400 k.w., 50 percent overload for 2 hours, 275 volts d.c. and 2,300 volts, 3-phase, 60-cycle a.c. It is only 51 in. high above the rails and has a track gage of 42 in. and a wheel base of 48 in.

The motor and generator leads can be brought out in almost any position to suit the purchaser's individual requirements. Extra flexible dynamo cable is used for the motor leads to the switching truck. They are attached directly to the machine at one end and at the switchgear end they are provided with high voltage disconnecting pot heads so that it is necessary only to pull the plug out when it is desired to disconnect the motor.

All of the switching equipment necessary for operation of a substation is mounted on the truck shown in Fig. 2. All the control circuits are wired up and the heavy copper is fitted in place so that it is only necessary to make the main power connections to the incoming and outgoing terminals before putting the equipment into operation. A set of high voltage disconnecting pot heads is supplied for the incoming line circuit as well as the motor leads. These plus an extra set of the removable portion of the pot heads permit of having the substation all ready for plugging the motor in when the set arrives from the old location.

The low voltage control circuit connections between the switchgear and the machine trucks are made in a multiple conductor cable provided at each end with a doweled coupling device. These coupling devices can be inserted in their receptacles in but one position, thereby insuring correct and speedy connection of the control circuits.

As previously mentioned, synchronous converters and mercury arc rectifier equipments can be made portable as well as motor generator set substations. If they are made portable it would probably be best to use a third truck for transporting the transformer. Inasmuch as these portable substations are primarily intended for underground service, it is recommended that transformers with Pyranol or equivalent fireproof insulating liquid be used. These insulating liquids are strictly noninflammable and do not give off inflammable gases. The slight increase in cost for Pyranol as compared with oil-insulated transformers is more than justified by the elimination of the fire hazard and the necessity for providing a fireproof room.

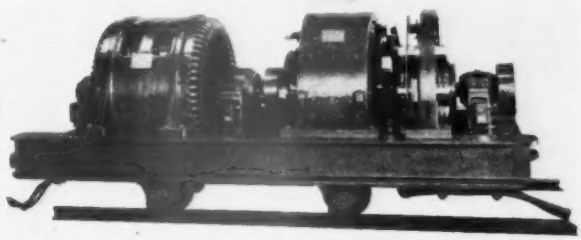


FIG. 1.—*400 kw. Portable Motor-Generator Set for Mine Service.*

The present-day mercury arc rectifiers are water cooled and since in most cases the mine water is not suitable because of its corrosive characteristics or lime content for rectifier cooling purposes, the portable equipment would include suitable heat exchanger unit, presumably of the water to air type, to provide adequate cooling for the rectifier unit.

When portable equipment is used and it is desired to relocate the substation, it is merely necessary to provide a suitable room with a carefully-leveled spur track to which the unit can be hauled, plug in the a.c. primary, and the secondary control cables and make the main d.c. cable connections. As the d.c. connections are the only ones which have to be bolted, and since there are only three joints to be made (positive cable to the panel, the panel to the outgoing feeder and the negative connection to the rail), the time required for getting the station into operation can be made very short.

The disconnecting process preparatory to moving is equally simple, as it is only necessary to uncouple the cable connections, hitch on the locomotive and haul the individual units to the new location. There are no miscellaneous parts to be gathered up and brought along as would be the case with a conventional stationary installation with the wiring in conduit in the floor.

Since the equipment is intended only for temporary occupation of a given location, a relatively inexpensive substation room can be used. If the roof structure is strong enough so that reinforcing is unnecessary, a very satisfactory arrangement consists of a knockdown type of shelter made of steel framework and corrugated metal or asbestos sheeting. The track must be well ballasted to prevent uneven settling, but it is not essential that a concrete floor be provided except for convenience if the station is going to be located in one place for a sufficiently long time to warrant it. The room should have adequate provision for protecting the material against dripping water and falling material and for keeping out unauthorized persons.

When laying out the substation structure, careful consideration should be given to the location and size of the air inlet and outlet openings in order that there may be no dead air pockets near the ceiling.

If satisfactory operation and long life of the equipment is to be obtained, adequate ventilation must be provided. One very satisfactory way of accomplishing this is to locate the substation in a cross cut or breakthru between an incoming and outgoing air passage. When so located, the substation is assured of a supply of fresh, clean air. The principal disadvantage to this arrangement is that any air used for cooling is lost as far as the mine ventilating air system is concerned. An alternative method of providing ventilation is to locate the substation parallel to the main entry and arrange to deflect some of the air through the substation and back into the main incoming air entry again. In any event, fresh incoming air should be used, as the outgoing air from the mine frequently carries moisture and corrosive fumes picked up from the mine workings.

One very important factor entering into the choice of new types of apparatus is the question of price, not only of the bare equipment itself but on the basis of a completely-installed substation ready for operation. Installation material and

labor costs vary considerably but it is probably safe to say that it would cost 15 to 20 percent of the price of the equipment to provide foundations and install and wire up a conventional stationary motor generator set substation, exclusive of the main power cable coming in. The ultimate installed cost of a portable motor generator set with automatic control substation just about balances this. The equipment from the factory completely wired up and ready for installation does cost approximately 13 percent more than the stationary equipment, but offsetting this is an installation cost amounting to only 7 percent or less of that of the equipment.

When it comes to a question of moving the substation, these same cost ratios prevail, that is, the portable equipment would cost roughly 7 percent or less to move as compared with 15-20 percent for the stationary set, and therefore it is possible to justify moving the substation with sufficient frequency to take advantage of the maximum possible saving in power losses in the feeders and improvement in voltage at the working face.

In general, where conditions are suitable for inside of mine location of the substation, portable equipment offers the operating engineer a means of furnishing d.c. power to the mine at good voltage and with a minimum of power loss in the cables. Good voltage means longer life of the motors, fewer burnouts, and higher speed and horsepower with an increased output of coal. Minimum power losses in the feeder cables mean actual dollars and cents saving in the monthly power bill. All of these advantages are obtainable for approximately the same initial installed price as for the conventional stationary type of substation.

An Answer to Efficient CONVEYOR OPERATION

By H. P. CHANDLER*

BY its nature, mining is more or less of a temporary character and most movable equipment is relocated at frequent intervals. With the adoption of conveyor mining, necessitated in many properties, this problem of relocation, in conjunction with the problem of safety and control, has assumed additional importance.

In every instance where conveyors and similar motor-driven equipment are so moved, control equipment must be relocated. Naturally, the fewer number of units required for such movement, the more efficiently and swiftly will the transfer be made. Time lost in such effort is time wasted in the production of tonnage.

Another factor in the relocation of electrically operated equipment and its accompanying safety and control devices is connection time. Here again we find many precious minutes consumed in effecting tedious and complicated connections under older methods.

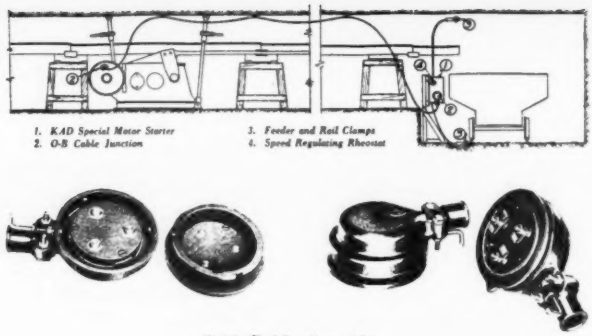
With these facts in mind, the Ohio Brass Company cooperated with the engineering departments of various operating companies in designing safety and control equipment that would positively control and protect motors and motor-driven equipment as well as afford convenient and efficient means for effecting relocations of this equipment.

The problem was attacked first from the standpoint of shaker conveyor installations where both the problem of positive control and connection time were salient factors.

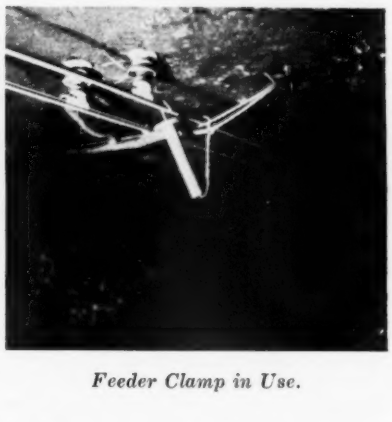
The primary outgrowth of this development was an automatic d. c. motor starter, a self-contained unit consisting of a quick make and break line switch, line contactor, timing contactor, starting resistance and "stop-start" push button station. The line contactor provided for instantaneous short-circuit protection in conjunction with thermal overload relay protection.

When this starter was placed in the field, it was assigned to exceptionally heavy duty in connection with the operation of uphill shaker conveyors and was not only subjected to severe tests but was under continual observation during operation. The results were highly satisfactory to all concerned. Here was a motor starter of advanced design, that would perform dependably and efficiently with all necessary units enclosed in an easily portable case for installation ease.

Satisfied with the progress thus far, but determined to delve further into the problem, an additional starter was designed which included all the features of the previous one plus a speed regulating rheostat, to maintain constant motor speed, and a three-pole attachment plug or cable junction to facilitate connection. This starter is equipped with either or both of these devices, the cable junction and the speed-regulating rheostat.



O-B Cable Junction.



Feeder Clamp in Use.

KAD Special Motor Starter with Speed-Regulating Rheostat.

The speed-regulating rheostat permits the adjustment of motor speed so as to obtain the proper frequency of strokes of a shaker conveyor or the proper motor speeds of other types of conveyors. This allows movement on the conveyor to be at a maximum for the material being handled. The rheostat is adjusted so as to eliminate the effects of annoying voltage fluctuations.

The cable junction enables the crew to connect or disconnect the equipment easily and quickly without the services of an electrician. Used on the end of a trailing cable it can be applied effectively to any motor or electrically operated equipment in the mine in addition to the starter. In mines where it is being used at present, the electrician and his men have thus been able to apply their time

* Development Engineer of the Ohio Brass Co.

Feeder Clamp.

more efficiently elsewhere on the property.

To further effect savings in time and effort, a means was provided whereby the crew might connect and disconnect the starter to the feeder circuit. A regular feeder clamp with rubber insulated handle, is employed for this purpose.

This arrangement of equipment, consisting of the starter, the cable junction, the speed-regulating rheostat and the feeder and rail clamp furnishes a maximum of protection and control, and, at the same time, entails a minimum of effort during relocation. Less time and effort spent in effecting connections of such equipment translate themselves into lower costs and higher efficiency.

In connection with trailing cable attachment, a fused trolley tap for tapping the trolley wire is also furnished. This economical device, closely allied to the aforementioned equipment, offers motor and motor-driven equipment complete protection from overloads and burnt-out armatures. No more burnt-out cables will annoy the management and no more injured men will need to be hospitalized.

Many operators have systematized their mines with these fused trolley taps. Both gaseous and non-gaseous properties find that their machines are operated more efficiently and economically with a fused trolley tap on the end of the cable. It automatically prohibits wrong practice as well as furnishing complete protection to man, machine and cable!

In the development of these devices, a step forward in the direction of better mining methods has been taken.

Safe Handling of TRAILING POWER CABLES

By H. V. WODTKE*

MUCH of the electrically operated equipment in mines and quarries necessarily requires the use of trailing cables for the power supply, for as a rule the operations involving moving machinery do not permit permanent type construction, with trolleys or other moving contacts. Since potentials as high as 5,000 volts are in use, and cable lengths of 1,000 ft. are frequent (lengths of 5,000 ft. are in use in the Lake Superior district, where a shovel may move from one part of the pit to another for loading different grades of ore), the safe handling of this type of power distribution is extremely important.

Manual Handling

First let us consider the actual, physical handling of the cables by workmen. The elementary precaution here, of course, is to shut off the current while cables are moved. While this may not often be practicable, it should be stressed as a safety measure.

Some companies use an iron hook with a wooden handle for moving cables. Any repair shop can make one. However, even when such a hook is used the current should be shut off, for a workman can be shocked if the cable has a defect, especially in wet weather.

A disadvantage of the hook is that the cable slides along while it is being moved. An equipment company approached a number of operators recently regarding the proposed manufacture of a hook which would graft the cable, but the suggestion was turned down on the score of expense.

Ten-thousand-volt linemen's rubber gloves with canvas protection are used by many companies, usually with a penalty of discharge or suspension for infraction of the rule requiring them. Rope slings, 4 ft. long, handled by two men, are also used for moving live cables.

Large trailing cables with braided copper sheath on each conductor are, according to the United States Bureau of Mines, quite generally handled with bare hands not even protected with rubber gloves. The sheath, which is grounded, is considered complete protection against shock. *It is not safe, however, to dispense with protective devices in ordinary cable, with three small separate wires as a ground, without the copper sheath around each conductor.*

Causes of Cable Damage—and Some Cures

Unless proper precautions are taken, one of the greatest causes of damage to trailing cables is the abrasion incurred as the advancing shovel or other equipment drags it along behind. Such abrasion leads to cable faults which, in addition to tying up equipment when a ground occurs, might easily cause a fatal accident to men handling the lines. A simple preventive is to prohibit operators from dragging their cables. When the shovel has to advance, the cable should be let out ahead of it, and the shovel then permitted to take up the slack.

Reels on large equipment have proved highly satisfactory to some companies, as the excess length of cable can then be rolled up out of the way. As a rule this does not prove practicable for smaller equipment, or for equipment where the housing swings through a large arc. Some trouble has also been experienced with reeled cables overheating.

No mechanical method of fastening the cable to the equipment is required where reels are used, but where there is no reel the cable should be clamped to the side of the shovel and enter through a bell-mouthed insulator to protect it for any position of the shovel. A wood or woven-wire grip is often used on small equipment.

Flying rock, blasting, and traffic passing over the cables are other common causes of damage. Obviously, the first precaution that suggests itself is to move the cable out of the danger zone whenever possible. As a rule, the major blasting operations are carried on in one part of the pit while the shovels are working in an entirely different part.

Heavy planks or other covering should be used to protect the cable against traffic. Sometimes the cable can be suspended on tripods or other supports to permit traffic to pass under it.

At one mine, cables suffered considerable damage where they passed under tracks without protection. The solution was a split-pipe trough made of 6 in. pipe, 8 ft. long, through which the cable could pass under the tracks.

Damage of the types just described can usually be blamed on negligence, and disciplinary rules usually have a good effect. As a case in point, at a large dam project, shovels operating at 4,500 volts showed defective cables. Investigation clearly proved negligence on the part of operating foreman, and the superintendent in charge made it a rule to suspend the foreman for one week without pay whenever a cable was carelessly damaged. After that, cables were removed before blasts and carefully planked for traffic, and damage due to negligence was eliminated.

Cables may lie under water for considerable periods. This is usually not harmful, even if the water contains acids and alkalis, because cable insulation today is available which withstands this exposure. The point should, however, be considered when cable is selected.

Electrical Considerations

Good practice is to have electricians inspect cables frequently—sometimes daily, depending upon the use—and discard them when the outer covering has become so cracked and deteriorated as to expose either ground or feed wires, even though megger tests indicate that the insulation is still in good condition. Some companies test by applying to the cable double the voltage which will be used under operating conditions.

A good ground should be maintained at each end of the cable. As mentioned in connection with manual handling, cables are available with woven-wire sheaths on the outside of conductors—either over each conductor separately, or on the outside of all three. An additional protection is the three small ground wires that make contact with the woven-wire sheath ground. The ground conductors should be connected directly to the frame of the shovel, with the other end of the ground wires lugged

* Assistant General Manager of Rubber Mills, Anaconda Wire and Cable Company.

solidly to the main ground system. Separate grounding cables of adequate cross-section are frequently used.

Even with the best cable equipment and most careful handling, there is always the hazard that the frame of the shovel or other equipment may become charged, and that anyone stepping onto it might receive a shock. Adequate grounding of the shovel or other equipment is an absolute necessity.

Cable Repairs

When cables are damaged, patches ought to be made in a workmanlike manner. Although many companies object that vulcanizing requires too much time and labor, vulcanizing is the one best way to patch cables. Relatively inexpensive electric vulcanizers are available for this work. As a rule, taping with rubber or friction tape is not durable—atmospheric conditions usually cause such repairs to loosen up very readily, especially if the cable is exposed in wet weather.

Recently I had an experience in point, when a Toledo, Ohio, company called us in for help. A No. 0000, 3-conductor cable had been damaged by falling rock. It had been repaired with friction tape, and the men were receiving shocks from surface leakage when they handled the cable. As the cable could only be repaired on a Sunday, there was no current of required voltage available. We used a metal mold about 12 in. long, wrapped the cable with the proper rubber compound, and after the mold was applied and held together by steel clamps, we applied heat from two blowtorches. A perfect patch resulted. I mention this case because it illustrates a very inexpensive method of repair, involving no capital investment for vulcanizing equipment.

In its Information Circular 6922, the United States Bureau of Mines reports on repair practices as follows:

"Most of the companies make temporary repairs in the field without sending the cable to the shop. One company uses a tape of semicured non-corrosive rubber. Another company makes very thorough field repairs; the fault in the line is located, the cable conductors are laid bare, and the electrical connection is made; the conductors are then taped properly and covered with a pipesleeve mechanical joint, which is sealed on each end with rubber glands. After a number of these mechanical connections have been made the cable is taken into the shops for vulcanizing. In another operation a splice is made with soldered connectors, then the insulation is penciled and spliced wrapped with rubber tape until the insulation is as thick as the original insulation; the insulation is then rewrapped, bound with copper wire, and the end of the jacket rubber penciled, and built up with rubber tape to the thickness of the jacket; the surface of the splice and well up on the jacket is then covered with friction tape and painted with all-dry insulating paint. Cuts in the jacket alone are cleaned out and filled with plastic rubber friction tape and paint. One company uses 40 percent semicured rubber tape, and friction tape for temporary repairs; it has a manual showing the types of repairs to be made at its operations. Badly cut cables of all companies are taken to the shops for vulcanization."

In conclusion, safety is of such importance in mining today that we hope these suggestions for safe handling of trailer cables will help the superintendent somewhat in meeting his safety problems.

Are TROLLEY WIRES UNDERGROUND on the Way Out?

By GEORGE E. STRINGFELLOW*

A TROLLEY wire underground is admittedly a hazard to both life and property. There is equally general agreement on the fact that the use of batteries in place of trolleys as a medium of supplying motive power, especially in locomotives of the permissible type, gives a mine what is undoubtedly the safest known system of haulage.

The hazards of the trolley wire are, of course, more pronounced in coal than in metal mining; yet it is in the latter field that the greatest progress has been made to date in completely supplanting trolleys with batteries.

In coal mining, the adoption of battery locomotives with few exceptions has been restricted to such short-haul duty as gathering and relaying, the trolley wire continuing as the major means of supplying motive power along the main haulage way.

In the metal mining field, the adoption of battery power not only for ore gathering but also for hauling the ore cars from the chutes in the drifts to the skip pockets at the stations has been predicated on the premise, supported by systematic cost analyses, that battery power has the advantage of greater operating economy as well as safety.

To be sure, the main haul in coal mining is, generally speaking, longer and likely to involve more severe grades, thus requiring larger batteries and, in some cases, more than one battery per locomotive. But where this is true, it should not be forgotten that their use permits a correspondingly larger offsetting saving in the maintenance of trolley wires, feeders, and bonded track.

Reduction in demand rates, elimination of electrolysis in air and water pipes, greatly lowered maintenance on commutators, controllers, and field coils as a result of lower voltage; avoidance of line-drop losses—all these are further factors to be considered in weighing the economies of battery power for the main haulageway.

* Vice President and Division Manager, Edison Storage Battery Division, Thomas A. Edison, Inc.

Geo. E. Stringfellow

With continued use of trolleys and further advances of the working places, some of these factors are growing constantly more serious. An analysis made today might show that a decided economy could be gained by adoption of battery power in many mines where the same might not have been true 10 years ago.

Recent trends in the use of battery power for industrial truck propulsion are also suggestive. Here, increases of 100 to 200 percent in battery capacities over the past five years have not been uncommon. In addition, use of two batteries per truck, which are exchanged at intervals so as to permit continuous operation has also grown common.

Adoption of battery power for many main hauls in coal mines together with arrangements for battery exchange so as to provide continuous operation would but duplicate modern battery industrial truck practice on a somewhat larger scale. There are already a few coal mines in which this plan is now in operation with the experience to date indicating that it is entirely practical.

The New Dorr Multizone Classifier

The Dorr Company, Inc., has introduced a new type of Dorr classifier, to be known as the Dorr Multizone classifier, for better all-around classification at all separations up to and including 80-mesh. The distinctive feature of this new classifier is the utilization for the first time of a combination of turbulence, high pulp velocity, and quiescent overflow to obtain a cleaner sand product and a more readily controlled overflow. A test program of several years preceded the announcement of this new Dorr classifier, 30 of which have been quietly placed in commercial operation in the United States, Canada, South Africa, and Australia to check results prior to public announcement.

Modern Underground TRANSPORTATION

Presented by | Bethlehem Steel Co.
Duncan Foundry & Machine Co.

TRACK PRACTICE at Willow Grove Mine of Hanna Coal Co., St. Clairsville, Ohio

By R. L. GILLISPIE*

MINE transportation engineers—if such persons exist—should base their lay-outs on forecasts which indicate the loads to be handled, the points at which these loads are to be received, the class and intensity of the traffic, the duration of the need for the specified transportation, and the general characteristics of the haulage. A factor of safety must then be imposed upon these determinations.

When not scientifically constructed and maintained a mine track may at times be as expensive in upkeep as a railroad track, incredible as this statement may appear. Mine tracks are too often laid with unsuitable materials, improperly and inadequately maintained, making their life entirely too short. Labor is continually spent on patching and repair.

Hanna Coal Company's Willow Grove Mine No. 10, St. Clairsville, Ohio, furnishes an example of a mine properly equipped to meet the latest demands for efficiency. This mine is now completely mechanized with heavy duty equipment of American Mining Congress design, as accepted by American Standards Association. Operations are continuous, in three shifts per 24 hours.

The main track from the tipple to the junction, a distance of about two miles, is made very substantial and permanent, with heavy, 60-lb. thermit-welded rails, laid on 5 x 7 creosoted wooden ties, with a suitable steel tie on each side of the welded joints which are 30 to 33 ft. apart. No difficulties have been experienced with this welded track which was laid to 42-in. gage. The entire tunnel is equipped with steel braces and gunnited throughout.

The switches are equipped with wide, heavy ½-in. x 5-in. plates under the points on every tie, to afford easy sliding of the switch point; also heavy galvanized steel braces are furnished on all main haulage switches.

The parallel type of switch stand used in the Willow Grove mine involves several new features. The weighted lever, moving parallel to the track, has a handhold grip in the weight and plenty of leverage. The mechanism is on dead center when either point is closed, locking the points securely and making it possible to get the weight in motion before starting to throw the switch. This type of a switch stand affords greater safety and insures against gapping switch points which frequently cause derailment. Spring rods are applied on all stands which makes the switch automatic.

The mechanism of the switch stand is strong, sturdy, and simple, with only three moving parts, and no bolts, set screws or rivets. Although light in weight, the stand can be used for rails of 60 lbs. and under. It is low and compact, only 3 in. high, and the entire mechanism and all wearing parts are placed above the top of the ties; a hole in the base of the stand is provided for any particles to drop down between ties, thus insuring cleanliness at all times.

Forty-pound rails are used in the entry tracks. In the original installation these tracks were laid on wooden ties, with a sprinkling of steel ties to secure the

Room Turn-out at Willow Grove Mine. (Note the interlacing of standard steel ties in the turn-out from the heel of the switch to the end of the frog.)

* Manager of Sales, Frogs and Switches, Bethlehem Steel Company.

track to the proper gage, particularly on curves. Later a new type of tie has been introduced in these sections, a combination wood-steel tie known as the composite tie, and consisting of a wooden tie with two steel plates with riveted fastenings. In future entry tracks this composite tie will now be replaced by the armored tie, a wooden tie with a bolted-on steel top, which, based on extensive service tests, promises to be very satisfactory for this purpose.

Room tracks and turnouts employ steel ties exclusively. In these applications steel ties offer enough advantages over wooden ties to offset their higher first cost. They are quickly laid, can be used over and over again, and they make the track safer because they hold the rails to gage more securely, eliminating spreading of rails which may cause derailment. They save head room, and can be taken in and out of the track quickly without disturbing the rail, and without the use of any tool except a hammer for riveted clip ties and a wrench for bolted clip ties. There are no spikes to drive, no gaging to be done, and they are easy and convenient to handle. Designs to fit all track conditions are available. They are ideal for locations where wooden ties become dry rotted.

The ease with which steel ties can be installed and taken out of the track speeds up the loading of the cars and increases the efficiency of the cutting and loading of the cars and increases the efficiency of the cutting and loading machines. This is particularly true where it is necessary to advance the track to allow the cutting machine to work as close to the face as possible. Before the loading machine can start operating this part of the track will then have to be taken up again. Such changes are made as frequently as three times in 24 hours. Wooden ties used under such conditions would become spike-killed after a few changes.

The room turnouts are laid with 40-lb. rails and equipped with steel ties cut to length, curved and drilled, ready to lay. Special steel switch ties, three or four in a set, according to angles of the turnout and the length of the switch are employed for these turnouts. These are used under the switch points; they have bolted clips which fasten the rails securely and which act as a brace to stock rails and automatically hold the ties to their proper location. Interlaced standard steel ties are used between the heel of the switch and the toe of the frog under the closure rails. All radii and angles are taken care of by the manufacturer, and the chances for mistakes during the installation are thus minimized.

The rapid installation of these turnouts increases the efficiency of the expensive track-mounted equipment, such as cutters and loading machines. Where such equipment is used it is frequently necessary to change room turnouts as often as once every two weeks. Using all steel ties four men are able to make such a change in 1½ hrs., compared with 3½ to 4 hrs. where wooden ties are employed. Furthermore, wooden ties will not stand up under such frequent changes, but become spike-killed after three to four applications. Steel ties, on the other hand, have been found in good condition after 20 to 30 changes.

Due to the accuracy with which the turnouts are constructed the heavy machinery can be moved with greater ease and at a higher speed than formerly used. Derailments are less frequent, and wear and tear due to pounding and impact is reduced.

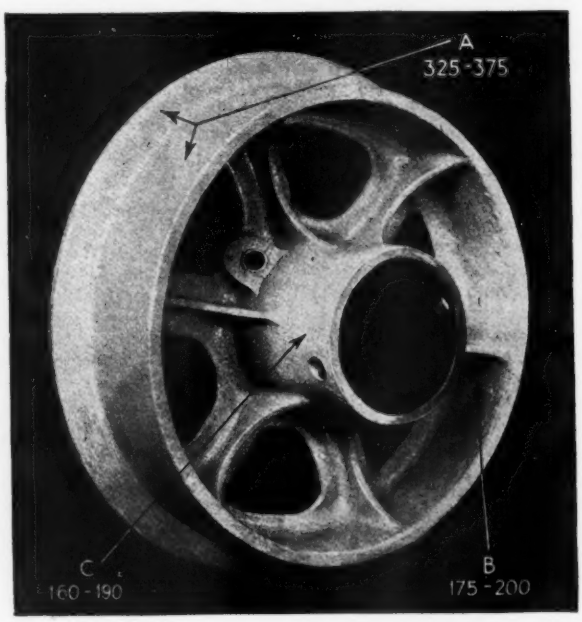
In view of these savings, and the greatly increased efficiency of the expensive track-mounted equipment, it is easily seen that the first cost of the steel ties becomes a factor of secondary importance.

All closure rails are furnished by the manufacturer cut accurately to length and curved to the proper radii. Flange bearing manganese steel frogs are used throughout all tracks, main line haulage, entry and room turnouts. Like most mechanized mines the Willow Grove Mine uses only steel cars, of large capacity.

Cast Steel Heat Treated Tread MINE CAR WHEELS

By F. E. RHINE*

CAST STEEL, heat-treated tread, mine-car wheels are more or less new to the mining industry of America. Although they have been used with major success in foreign countries for years, coal operators of America have been rather backward about considering the use of cast steel wheels mostly on account of the extreme high prices that were asked for these wheels 8 or 10 years ago. But since that time, and in the last 4 or 5 years, prices have been adjusted, and manufacturers have learned more concerning cast steel wheels, and are therefore in a better position to pass information along to the operators which they are doing.



By using cast steel, heat-treated tread, mine-car wheels there are several advantages to be taken into consideration: The car is lightened considerably on account of the reduction in weight that can be made in the wheels. In some instances 16-in. wheels have been reduced in weight as much as 85 lb., which of course means considerable in a trip of 40 or 50 cars.

Also all breakage of wheels is eliminated, and if wheel should for any reason whatsoever become flattened, flat spot will roll out in a short period of time, which of course is a very important item.

The Old Ben Coal Corporation was the first purchaser of cast steel wheels in Illinois. They have been using cast steel wheels since 1934, and are changing their equipment from chilled grey iron wheels to cast steel, heat-treated tread wheels, and by so doing have made a great savings resulting from delays caused by breakage and flat spots on chilled grey iron wheels, which of course in a run of a year can amount to a great deal. These wheels were manufactured and sold by the Duncan Foundry & Machine Works, Inc., Alton, Ill., who are also manufacturers of chilled grey iron wheels, but after careful consideration and several years of experimental work with cast steel, heat-treated tread wheels, placed same on the market. Since that time they have manufactured cast steel wheels and have endeavored to persuade all their customers to their use. Old Ben Coal Corporation was the first in Illinois to become interested and are rapidly replacing their chilled cast iron wheels with cast steel, heat-treated tread wheels.

The use of cast steel, heat-treated tread wheels saves time and money, due to eliminating practically all breakage, rolling out their own flat spots, and having longer life.

* Duncan Foundry & Machine Co.

Speeding The Wheels Of Production

Presented by | Timken Roller Bearing Co.
S K F Industries, Inc.
New Departure.
The Fafnir Bearing Co.

Correct Lubrication Essential to BEARING Life

By E. C. REITHER*

MINE operators are confronted with a wide range of lubrication problems. Cars present one group of problems and industrial equipment another, yet the life and satisfactory service of a car or piece of equipment depends to a large degree upon whether or not it is properly lubricated, assuming of course that the bearings have been properly selected for the service imposed. Consequently, when anti-friction bearings were introduced in the mining industry The Timken Roller Bearing Company began an intensive investigation of the lubricants available; that study has been continued and thousands of tests are made every year.

Correct lubrication involves several factors. First of all, the closures must be properly designed and correctly applied. Then the lubricant must be selected to meet the conditions under which it must function. Provision must be made for renewing or replacing the lubricant and for adjusting the bearing to take up wear, for a lubricant cannot be expected to completely eliminate wear even though it does reduce it to an almost negligible item under most conditions.

Correct design and application of the bearings themselves plays an important part in the selection of a lubricant. If a bearing is too light for the loading imposed on it, heat is generated and the consistency of the grease reduced to such a point that the oil leaks out past the closure. Sufficient space for lubricant must be provided in the bearing, for unless this is done the lubricant will be destroyed and fail to accomplish its purpose. This grease carrying capacity is particularly important in the case of mine car bearings, for lubrication intervals are long and there is a natural tendency on the part of operators to keep cars in service just as long as they seem to be working all right without inspecting the bearings to see whether they are being properly lubricated. A grease reservoir thus acts as a safety factor and assures a longer bearing life than when only a bare minimum of grease is used.

Fundamental in this type of design is the shrunk-on dust collar against which the bearing cones are seated. This unit, which is of steel, is permanently shrunk in place on the axle and serves as the inner seal of the bearing, being provided with a series of annular grooves for certain types of application and with a mating labyrinth assembly in addition to the annular grooves in other cases. As a result, the entrance of dirt, grit and water is prevented and at the same time grease leakage is avoided. Figures 1 and 2 illustrate typical applications of these closures, which may be combined with other seals as well when necessary. Timken engineers make it a point to familiarize themselves with the conditions existing at the mines where the bearings are to be used before making definite recommendations, for upon the efficiency of the closures selected will depend the amount of lubricant used and the frequency of lubrication, both of which have a major effect on the cost of maintenance.

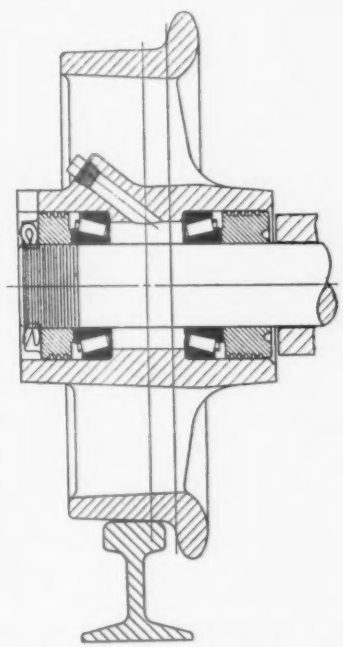


FIG. 1.

The shrink fit of the wide inner dust collar is adequate to provide proper backing for the inner cone. The stress relief groove in the collar reduces concentrated axle stresses. The straight axle reduces machining cost. A threaded outer closure is used to obtain bearing set-up replacing the conventional nut and hub cap.

Ever since these bearings have been applied to mine cars, a series of tests and research studies have been maintained in the company's lubrication laboratory. All types of lubricants are constantly being checked to see that they are up to standard. They are studied to see what changes occur over a period of time under operating conditions, how they are affected by oxidation, whether or not they separate and lose their value when temperatures rise or stiffen and channel in cold weather. No grease will last forever. Temperatures, sweating, mine water; all these factors affect the life and value of a lubricant. On such test work, plus operating experience, is based the approved list of lubricants.

In most cases a lime soap or water repellant grease of medium to heavy consistency is most satisfactory for use in mine cars. This is slightly heavier than would be specified for minimum frictional operation or ease of application, but with pressure lubrication and the severe operating conditions encountered in most mines, greases of this type usually give best results.

However, in cases where the mines are dry and long hauls are encountered

* Manager, Mine Car Bearing Sales, The Timken Roller Bearing Company.

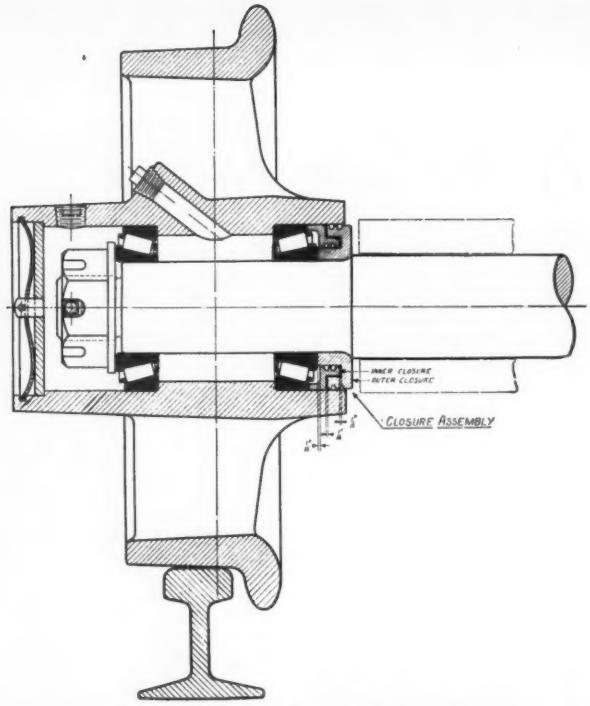


FIG. 2.—*Details of Labyrinth-Type Closure.*

it is not necessary to use water repellant greases. Temperatures are likely to run higher, due to the use of brakes on the down grade runs. To meet these conditions a high melting point soda soap grease should be used. This example, which is not uncommon, serves to point out the importance of analysing operating conditions with a lubricating engineer before deciding upon the type of bearing, type of closure, and kind of lubricant to be used.

For most cases, we have found that greases meeting the following basic specifications will give good results. However, local conditions may necessitate changes, which should be made in conjunction with the recommendations of a skilled lubricating engineer.

BASIC MINE CAR BEARING GREASE SPECIFICATIONS

The grease should be a smooth, well manufactured product, composed of a high grease soap and a refined, well filtered mineral oil. It should be free from corrosive matter, grit, rosin, waxes, talc, mica, graphite, clay or fillers of any kind.

Consistency by the Karns-Maag method should range between 25.0 mm. to 40.0 mm. at 75° F. ASTM Penetration approximately 250-300; ash should not exceed 2 percent; corrosion, a bright copper plate shall show no discoloration when submerged in the grease for 24 hours; moisture should not exceed 1 percent; the grease should be such as will not emulsify readily with water; the oil from which the grease is composed shall conform to the following tests: Flash, Minimum 340° F.; Fire, Minimum 380° F.; Viscosity at 100° F., Saybolt Universal 200 Seconds Minimum; Colt Test (Pour), Minimum 30° F.

Standard practice is to inspect and lubricate mine car wheel bearings every six months. However, we have records of many companies who lubricate their cars but once a year, and in some cases allow them to run even longer without inspection. This is not a recommended practice, however, for old grease is subject to oxidation and contamination by moisture and grit even with the best closures. In some cases, where extremely severe water conditions are encountered, the operators find that best results are secured by keeping their wheel bearings packed full of grease at all times, the grease serving as a seal to keep water and dirt from damaging the bearings. This serves to emphasize the vital importance of constant lubrication, for no bearing can be expected to stand up under exposure to dirt and moisture particularly not where the water is corrosive, as it is in many mines. Lubrication intervals should therefore be established individually for each mine to meet the problems encountered in that mine. Now that greasing can be done with a pressure system the nuisance of wheel removal and the mess of applying "black strap" with a paddle is eliminated, mine operators are keeping their equipment in better condition, thereby saving power, reducing repair costs and cutting depreciation charges.

Combining sound engineering and design with proper lubrication and maintenance reduces bearing cost to a surprisingly low figure. Experience shows that it is not unusual for bearings to outlast several sets of wheels or even cars, some cars having been in service for about 20 years without having replaced a single bearing part. In those cases lubrication has been regular with results that speak for themselves in long years of service at low costs.

BEARINGS and Their Importance in Increasing Efficiency and Reducing Cost

By ROBERT C. BYLER*

MINING machinery has reached such an advanced stage of development that the preference of one unit to another is largely based upon some feature that simplifies its use, increases its ruggedness and durability, or reduces the upkeep cost.

The service derived from most mining machinery is so vitally dependent upon the reliability of the bearings that an improvement over what has hitherto been standard practice must receive the closest consideration.

For that reason, more and more manufacturers are becoming bearing-conscious . . . are turning from the costly sliding friction of the plain bearing to the precision, long life, and economy made possible by the rolling motion of the ball or roller bearing.

To keep pace with these steadily-increasing demands, bearing manufacturers are solving problems of speed that vary perhaps from 50 r.p.m. to 50,000 r.p.m.; problems of load that vary from the ability to sustain a feather's weight up to tremendous crushing stresses of thousands of tons; problems that represent a combination of these things.

They are making ball bearings that are self-aligned, that can take high speeds, radial and thrust loads in any combination in either direction; roller bearings that can take severe punishment year after year without showing appreciable signs of wear; housings that prevent lubricant leakage and friction resulting from the intrusion of dust, grit, dirt, or moisture.

Among the outstanding types of antifriction bearings are the self-aligning ball bearing, which is self-contained and has the inherent property of alignment insuring full capacity under any misalignment condition; the spherical roller bearing, which is also self-aligning and self-contained but built for brute jobs; the deep-groove ball bearing with deep, uninterrupted raceways, permitting radial and thrust loads in any combination in either direction; and the cylindrical roller bearing with its high radial capacity.

All these bearings are designed to stand up for years without offering trouble, without demanding correction for wear, and requiring only occasional lubrication. These factors, together

* S K F Industries, Inc.

with their ability to maintain microscopic tolerances for indefinite periods enables moving parts to keep going smoothly without delays and their consequent loss in production. The necessity for stopping a machine for the purpose of disassembling it, taking off the plain bearing for re-babbitting, and then putting the machine back together is no longer a regular habit in mines equipped with machines that run on anti-friction bearings.

As an illustration of the importance of anti-friction bearings in increasing efficiency and reducing cost, the mine locomotive stands in a class by itself. In fact, the wide use of ball and roller bearings on electric motors today can be traced directly to the successful performance of a self-aligning, self-contained ball bearing that pioneered commercially on a mine locomotive motor in 1908.

Reduced to the simplest terms, this type of bearing consists of an outer ball race, an inner ball race, two rows of balls, and a retainer for properly spacing and retaining the balls between the raceways.

The inner race contains two grooves, each ground to a radius slightly larger than the radius of the balls, while the outer race is ground in the form of a section of a hollow sphere whose center is the center of the axis of rotation. As a result of this construction, the balls, retainer, and inner race are free at all times to rotate at any angle within this spherical outer race, and will, without subjecting the races to any undue strain, adjust themselves to any possible degree of deflection without binding the balls or introducing any obstacles to immediate and automatic compensation for any shaft springing or deflection.

The ease by which this self-alignment is accomplished will be fully understood when it is pointed out that the balls *roll* on the surface of the spherically-ground outer ball race with a pure rolling action and without sliding friction. This action is facilitated by the distribution of the load over a large number of balls, and as the load is automatically and equally divided between both rows of balls, the most favorable working conditions are obtained.

By turning back the pages, the advantages of this ball bearing stand out in sharp contrast to the disadvantages of plain bearings which reigned supreme in mine locomotive motors in the mule-and-cart days of coal conveying.

When plain bearing motors were used on mine locomotives, the bearings were a source of frequent trouble.

Records show that 60 percent of mine locomotive troubles stopped when ball bearings were introduced. It was found that ball bearings in the motors could be kept dust-and-grit proof, that oil lasted in them for months, and that they allowed the motor to be made very short and, therefore, adaptable to the scant space present on the locomotive.

With mining conditions demanding a powerful d.c. motor with large torque to pull the loaded coal cars up the high percent grades of the slope and full current most of the time, ball bearings not only assure a better motor mechanically by decreasing friction, but improve its commutation and make a better motor electrically. They entirely eliminate oil-soaked commutators and windings and keep the armature where it belongs. In addition, they save from 10 to 27 percent of the overall size required by plain bearings.

The Wedding of the BEARING and the SEAL

By P. W. SCHUBERT*

IN many installations, ball bearings must operate under conditions highly detrimental to the bearings. In the past, these bearings relied mainly upon the ingenuity of the machine builder for such protective measures as he could build into his product. Protection in this sense involves prevention of the abrasive, clogging or obstructive action of dirt, steel chips and other foreign matter, also the assurance of adequate lubrication.

For example, with the conventional non-sealed bearing, it is obvious that, as far as the bearing itself is concerned, there is nothing to prevent dirt and other particles from getting into the bearing. Furthermore, it is evident that whatever lubricant may be used in the surrounding mechanism, it will also become the lubricant for the bearing—a condition difficult to control and hardly conducive to any guaranty of long life. Obviously, therefore, the machine builder must provide means for guarding against the entrance of wear inducing substances and for lubrication, he may only trust that the machine user will select oils or grease least detrimental to the bearings

Still further, it is easily recognized that with the non-enclosed bearing the machine user must give thought to the bearings in considering the maintenance of his machine during the life thereof. This way lies the danger in bearing lubricant and in addition the element of maintenance cost also has considerable influence upon the efficiency of the installation. Still another problem present in many cases involves oil leakage to the detriment of the product. With all these factors in mind, considerable development has been undertaken during the past nine years, commencing with a patented design brought out by the New Departure Division of General Motors.

During this period the design and method of applying integrally mounted closures to ball bearings, has so improved that today, it is possible to secure, as a standard product, bearings which are lubricated for their life. It can readily be seen that such a perfected bearing will practically eliminate the problems of faulty lubrication, maintenance cost and the detrimental effect of oil leakage upon the product. Figures 1 and 2 show cut open bearings with sections of two kinds of seals.

Several designs have been developed for various applications, such as the wide double row bearing for mine car wheels. In this mount the bearing is carried in a journal box which has a limited vertical travel in the casting fixed to the car

* New Departure.

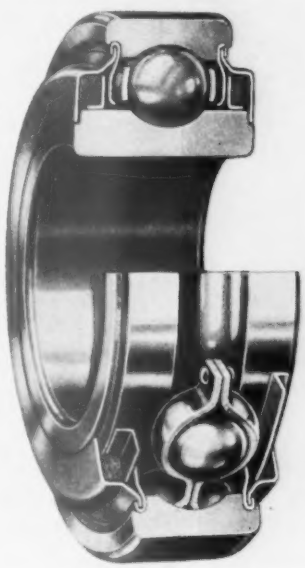


FIG. 1.
Another Type of Seal.

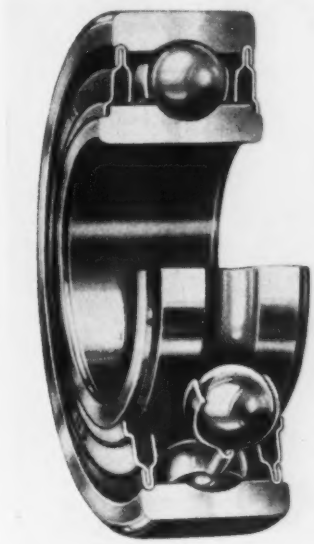


FIG. 2.
Cut-Open View of Single-Row Bearing with a Type of Closure.

frame. Due to the wide unit-bearing construction, the journal box is of simple design and because of the elimination of bearing press fits servicing of wheels or axle shaft may be accomplished very quickly and therefore at minimum cost to the operator.

Another development in the use of sealed bearings is the conveyor mount. Stub shafts supporting the center rolls are bent at the required trough angle, as indicated in the figure. Near each end a short section is machined cylindrical to take dust caps pressed tightly into place. When the rolls are mounted, these dust caps being slightly smaller than the diameter of the bearings, fit with a suitable running clearance into the ends of the bearing housings. Additional bearing protection is thereby obtained, but without the disadvantage of loose extra parts. Thus, conveyors called upon to operate in out of the way places, when equipped with a sealed bearing of this type (lubricated for life), are more satisfactory in every way—maintenance requirements are practically eliminated.

The mine car wheel bearing is so designed that it brings to both the car builder and operator very definite advantages. The two rows of balls in this bearing are spaced very wide apart and are preloaded to assure even better rigidity than where two separate bearings are spaced apart the usual distance. The equivalent center to center spacing is greater than the bearing over-all width. These bearings are delivered lubricated with their own special grease and are thoroughly and permanently sealed on both sides, assuring a positive closure throughout the life of the bearing. Because of this positive sealing these bearings may be handled without the remotest possibility of contamination by dirt or entrance of water—requiring no attention for lubrication or adjustment of any kind, reducing maintenance cost to the vanishing point. The extreme width of both inner and outer ring allows a fairly easy bearing fit on the axle and in the wheel. Worn wheels are therefore dismounted and the bearing removed for use in new wheels without need of special tools.

The conveyor roll bearing permanently sealed, eliminates all need for separate closure parts and further, its design is such that adjusting nuts, springs, collars, long shafts extending through the rolls, or other miscellaneous items, are not required. The unique design of the inner ring, accommodating a spherical end on the stub shaft, eliminates potential misaligning loads. This conveyor roll bearing not only eliminates all lubrication expense for the operator but it needs no adjustment of any kind and thus maintenance requirements are practically zero. It is proof against water, sand, cement, coke, dust, or other injurious substances.

These are but two of the many interesting types of permanently sealed and lubricated bearings that have emanated from nine years of development work. Other designs are readily available to suit varying requirements.

BALL BEARINGS for the Modern Mine Car

By C. A. BERG*

A MORE open mind toward new improvements is an invaluable asset for any industry; this discussion is an endeavor to indicate what has been achieved in the application of modern ball bearings to mine car wheels and should aid in correcting any lack of attention concerning the introduction of a principle that has been almost universally accepted in other fields.

History and Early Developments

In recorded history, it is found that balls and rollers were often used to ease the path of sledges and the movement of building material, such as in the building of the Pyramids.

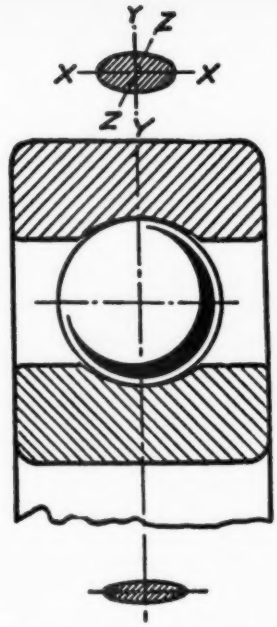
It was the invention of the wheel and of the wheel and axle that brought the plain bearing into existence, however. From that day to this, efforts to improve on this ancient contrivance have been virtually continuous. The first wheels were made entirely of wood, but as metals gradually came into use, the endeavor to lessen friction was restricted to the improvement of the metals. With the advent of lubrication, the plain bearings slowly became more efficient.

Through centuries there were no attempts to use balls or rollers in bearings supporting wheels or axles, and, actually, anti-friction bearings made little progress during the first three or four thousand years of which there is a record. It was not until the nineteenth century that any headway was made. The commercial development of the anti-friction bearing dates from four major inventions of the last century—the steam engine, the electric motor, the bicycle, and the automobile.

With the coming of steam and electrical power, machines were developed to operate at higher and higher speeds. This graduated from a minor annoyance to a major obstacle. In short, anti-friction bearings became a necessity.

Curiously enough, the ball bearing owes its commercial debut to the bicycle more than anything else. Rapid strides in the development of ball bearings were made during the bicycle era. During this period, a comprehensive study of the properties of balls and bearings was engaged in by Stribeck and Goodman.

These studies are still looked on as the basis for ball bearing designing. Elaborate research gave the ball bearing a sound scientific foundation. As the automobile supplemented earlier forms of transportation, anti-friction bearings really came into their own, they making the motor car possible.



Typical Contact Areas of Ball Bearing. (Note "spot"—not "point"—contact of ball, resulting in a load support area fully comparable to roller bearing designs.)

Reliability

Ball bearings could not have gained the widespread acceptance that they have in the past few years without embodying the utmost reliability. Airplanes, railway cars, steel mill equipment, pulp and paper machinery, a great variety of machine tools, textile machinery, mining machinery, delicate apparatus such as gyroscopes, signal relays, train control equipment—indeed almost an endless list of successful applications can be credited to ball bearings.

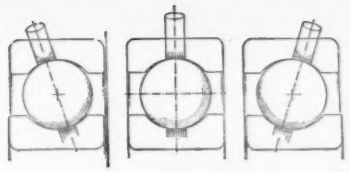
Ball Bearings in the Mine Car Wheels

With the infiltration of ball bearings into mining machinery of all types, mine cars equipped with ball bearing wheels have been a natural development. Early steps in this direction indicated the extreme desirability of a frictionless, reliable and fool-proof bearing design for this service.

While both ball and roller bearings can effect appreciable economies in car wheel service, it should be remembered that the ball bearing is the ultimate development in car wheel bearings, and is admittedly the most nearly frictionless of all types.

Contrary to the impression, the ball bearing need admit no inferiority in its application to a mine car wheel—which

* The Fafnir Bearing Company.



Deep Race Design—Maximum Capacity for Loads from Any Direction or in Combination.

fact has been substantiated in service. The accompanying diagram serves to illustrate that the so-called point contact of the ball bearing is actually an elyptical "spot," and it is this contact area that constitutes the loading zone. This holds true whether the load is radical or combined with varying amounts of thrust, as can also be seen from the diagram.

In mine car wheel service, all-around capacity must be considered. The ability to carry only radical loads or only thrust loads is not sufficient. It is here that the ball bearing stands out in marked superiority, since it carries radial or thrust loads in either direction—singly or in combination with equal versatility —something not true of other types of bearings.

Only with ball bearings can integral seals be supplied for impending the entrance of dirt into the wheel hub, as well as aiding in the retention of the lubricant. With dirt conditions being what they are in the mining field, this is indeed an important consideration in selecting the type of bearing for greatest life and ability.

The application of ball bearings to a mine car wheel is by no means experimental. They have demonstrated their worth many times over, so that the popular preference for them is based on sound experience. Thousands are operating in wheels under all sorts of conditions in mines from Honduras to Alaska—not only in coal mines, but in metal mines, salt mines, phosphate mines, and the like, both in surface and underground operation.

As for actual load carrying capacity to withstand the severe service of mine car operation, ball bearings today are being successfully employed in wheels of mine cars where the gross weight extends from 5,000 pounds to 25,000 pounds.

Advantages of Ball Bearing Mine Car Wheels

The resulting advantages of ball bearing equipped mine cars are many. Prominent among them, however, are:

Ease of Running.—The steel ball with its perfect sphericity possesses advantages not equal in any other form of rolling body in that, whatever the angle at which the load may be applied, true rolling motion is not impaired. Cars which roll easily obviously take less time to move and eliminate waste in handling cars.

Greater Tonnage.—The number of cars per haul can be greatly increased and production capacity accordingly.

Power Saving.—The fact that the ball bearing can take thrust as well as radial load within itself with no need for taking side thrust on friction surfaces when going around curves can greatly reduce haulage problems. Either the same number of cars can be hauled with far less power, or a greater number of cars can be operated without increasing the power requirement. The curve is the "neck of the bottle," so to speak, and the ability of a ball bearing to carry combined loads with true rolling motion makes haulage on curves a simple matter in comparison to the problem it once presented.

Starting torque is radically reduced due to the low co-efficient of friction existing in a ball bearing and, consequently, there is no jerking or spinning of locomotive drives. Obviously, this results in fewer broken down draw bars, burnt out armatures, and general wear of equipment.

Lubricant Saving.—With properly designed seals into the wheel hub, coupled with the integral shields of the ball bearing, lubricant administered to the wheel hub at the beginning of its period of service will last over a long period of time. Of course, the proper selection of a lubricant is of paramount importance, since its essential functions are to protect the highly finished surfaces of the balls and raceways, and in a degree assist in the exclusion of dirt and water by forming a supplementary seal.

That the subject of bearings for mine car wheels is of vital interest and that there are very definite advantages over the original plain bearing is evidenced by the fact that 95 percent of mine cars built in the past five years have been equipped with anti-friction bearings of one sort or another. The increased efficiency and lower operating cost, lower maintenance and greater dependability amounting to virtually complete protection against extensive breakdowns are factors in the use of ball bearings which cannot be ignored where profitable operating is at stake. With the annual haulage bill for coal mines alone amounting to over $100,000,000, a wide field for saving is apparent.

Efficient LUBRICATION Means Cost Reduction

Presented by | Standard Oil Co. (Indiana)
Sun Oil Co.

Reducing Production Costs Through Proper LUBRICATION

By L. C. WELCH*

NO code or law prevents the savings that can be made through better lubrication; and the results are obtainable for practically no investment. Although greater volume of production is in prospect for most industries costs are also increasing—taxes, labor charges and prices for material. To meet these depression-schooled, price-conscious markets, every possible operating economy is greatly needed. It goes without saying that this is particularly true of mining operations which are today so largely conducted by machinery.

Much of mining machinery and equipment involves large capital expenditures. In the interest of economy it is obviously worthwhile to prolong the useful life of this machinery as long as possible. It is also obvious that the exercising of "proper care" is the real way to keep machine and equipment maintenance and repairs at a minimum.

Repairs are costly in several ways. The parts themselves are expensive and their installation involves the expense of labor costs and often a tie-up of production. Moreover, repair parts for some of the larger machines are not always carried in stock and there is the likelihood of operations being delayed while parts are shipped from distant points or until a casting can be made and machined.

The lubrication engineer can do much to reduce operating costs through his skill in the proper selection and application of lubricants. Striking examples of how correctly selected and applied lubrication has reduced operating costs are readily available in the experience of the lubrication engineer. As we examine a number of these let us keep in mind that the individual economies cited must of course be reflected in ultimate lowered costs; not merely a saving in one item to the disadvantage or neglect of another. A lubrication engineer knows that the pursuit of lower lubrication costs goes down strange and hidden byways. Often the effect of these costs appears on the cost sheet far from the cost of the oil.

The following examples illustrated clearly the possibilities which exist at the average mine for improving lubrication and how the selection of the proper lubricants for different classes of service actually resulted in the accomplishment of the advantages sought.

At a large coal mine in Illinois, it was customary to use grease in the lubrication of Duncan mine cars of the modified hollow-axle type in which the lubricant was required to pass through drilled holes one-quarter inch in diameter. Haulage costs were high and the cost of the lubricant itself was excessively high. The cause was diagnosed as failure of the grease to flow freely through the small openings. To remedy the condition an oil of correct viscosity and surface tension was selected. An immediate saving of two-thirds in the cost of lubrication was affected and a substantial lowering of haulage costs resulted.

At the same mine trouble was being experienced from a large amount of carryover of grease onto the armature windings in Joy Coal Loading Machines and moreover, a large amount of the grease was wasted. To overcome the trouble a change was made from a lime soap grease of high soap content and a small percent of low viscosity oil to a soda soap grease of relatively high oil content. As a result of the change a definite saving was made both in lubricating costs and in costs of labor through successful elimination of the difficulty.

At another mine in the same vicinity the management could not decide what lubricant to use for the general lubrication of Goodman Loading Machines, particularly for the clutch and gear units. A lubrication engineer made a study of the operating conditions and machine requirements and recommended an oil possessing a high degree of refinement in addition to other qualities especially suited to the conditions existing. The choice made proved to be correct, for the machines which were installed more than eight months ago are still performing satisfactorily on the original lubricant prescribed, so satisfactorily, in fact, that no replacements of clutch discs have yet been required.

In another somewhat similar situation, a Montana coal mine took the advice of a lubrication engineer more than a year ago and has already saved more than $300 in clutch repair bills as a result.

An illustration of the precaution that sometimes attends a lubrication engineer's recommendations is contained in the experience of another mining company where difficulty was being experienced in lubricating large eccentrics on shakers. A lubrication engineer carefully diagnosed the situation and recommended that a certain lubricant be used. However, in view of past difficulties experienced in attempting to lubricate these eccentrics, the master mechanic was skeptical of the lubrication engineer's recommendations — so much so that the lubrication engineer was not permitted to put his oil into the unit until one hour before closing time, so that not more than one hour would be lost if the oil failed. On the following day he was permitted to put the oil in two hours before closing time for the results had already given indication of proving satisfactory. The next day he was able to put the oil in the first thing in the morning. The end of the story? The lubricant has been giving perfect service now for more than three years.

At a mine in central Illinois a lubrication engineer found an opportunity to reduce lubrication costs on a 950-B Bucyrus Erie 30-yd. electrically operated shovel. A large number of different greases was being used and the lubrication engineer realized that in this particular case one lubricant could be utilized in several places. In this way he could simplify the administration in the actual handling of lubrication routine

* Asst. Gen. Mgr., Technical Department, Standard Oil Company (Indiana).

and improve dependability by avoiding possibilities of running short on some special lubricant necessarily stocked in small quantities. His consolidated recommendation was applied successfully, for the shovel has operated continuously for approximately 10 months and during that entire time not one condition was found that showed lack of lubrication. The improved performance was accompanied by a reduction from the normal consumption of greases previously used of approximately 40 percent.

One time an extra-quality Rock Drill Oil was prescribed by a lubrication engineer after considerable deliberation since the price was somewhat higher than that being paid for another product. The difference in price, of course, did not appeal to the management, but it proved to be considerably more than offset by the improved performance of the product resulting in 15 ft. more drilling per day. The stepped-up performance, to be sure, amply justified the recommendation, for it resulted in more ore to hoist and increased production.

In a case quite opposite to that just described, a lubrication engineer was able to effect large savings by making a change to a lower priced lubricant. A substantial reduction in steam cylinder lubrication cost was made in a plant operated by a lead company in Missouri.

	No. 1 Engine		No. 2 Engine	
	Cyl. Oil in Service	*Recom. Cyl. Oil*	*Cyl. Oil in Service*	*Recom. Cyl. Oil*
Hours run	576	504	265	262
Oils used, total gallons	103.5	94.75	35.75	31
Oil used, gals. per hour	.17968	.18799	.1341	.1183
Cost per gallon	$ .816	$ .623	$ .816	$ .623
Cost per hour	$ .146618	$ .117117	$ .10943	$ .0737
Saving per hour		$ .029501		$ .03573
Normal hours operation per yr.		8712		4356
Saving per yr. using recommended oil		$257.01*		$112.07*
* Annual saving on both units..		$369.08		

A record of the cylinder oil tests which were conducted following the recommendation is given above.

Recently some outstanding examples of cost reductions, resulting from proper selecting of lubricants, have come about through the introduction of low cold test and low viscosity oils for improved lubrication of equipment exposed to low outside temperatures in winter. In a large number of instances this practice has resulted in expediting the movement of railway cars to and from the tipple, avoiding sticking of rings on motor bearings employing this method of lubrication and facilitating the operation of car puller engines and in operating hydraulic jacks at strip mines.

The value of lubrication engineering service of the kind here described lies not only in specific amounts of savings which can be made, but in the establishing of a principle which should be applied in the mining industry as an unvarying policy—of utilizing every legitimate opportunity to cut costs and to prevent the accumulation and continuation of low-efficiency methods. It is a cardinal rule of business health that such a policy should not be neglected.

An Effective Aid in REDUCING PRODUCTION COSTS

By HOWARD J. WILSON*

TODAY coal mining is a matter of mass production involving the use of a wide variety of equipment and depending on continuous operation for profits.

As in other mass production industries, with heavy equipment investments, lubrication is an important factor in operating efficiency and costs.

In coal mining, competition within the industry and from outside sources—oil, gas, and water power—is creating a constantly greater demand for higher operating efficiency of equipment and low maintenance expense because of their direct relation to production costs. Moreover, there is a continued trend toward more complete mechanization; with equipment investment becoming increasingly greater. Thus, today, correct lubrication more than ever before is essential to profitable mine operation.

Long experience in the lubrication of mining equipment shows that the desired results can only be obtained when careful consideration is given to each of the following factors:

1. Initial cost of equipment.
2. Expected life of equipment.
3. Maintenance of equipment.
4. Continuous operation of equipment.
5. Selection of the proper type and quality of lubricant.
6. Minimizing mechanical friction.
7. Minimizing fluid friction within the lubricant itself.
8. Minimizing consumption of lubricant.
9. Elimination of waste of lubricant through proper storage and efficient handling facilities.

To enlarge on this, it seems appropriate to consider the lubrication of several types of equipment commonly found on most operations. To take one example—Air Compressor Lubrication.

Air Compressors. The lubrication of air compressors is most efficient when a highly refined oil with minimum carbon content and good atomization qualities is selected. Such an oil covers all moving parts and if an excessive amount of oil is fed to the cylinders it will travel with the discharged air and not lay in the air-lines to pick up dust and grit that may have entered the air cylinders through the intake.

To make the proper lubricant selection for the various types of air compressors on the market, it is necessary to consider:

1. Number of stages used.
2. Whether cylinders are water or air cooled.
3. Whether intercoolers or aftercoolers are used.
4. The temperature of the intake air.

The viscosity of mineral oils will vary greatly with the decrease or increase in temperature. Therefore, to obtain proper atomization and distribution of oil to all parts, it is important to know the temperature at which the oil comes in contact with the intake air used in atomization.

Careful investigation and study of air compressor conditions in various parts of the country have demonstrated in practically every case where compressor explosions have occurred that they have been due to one or more of these four reasons:

1. Excessive carbon accumulation on the piston rings and discharge-valves causing what is known as "re-compression," that is, at each discharge stroke a percentage of the hot discharged air is taken back into the cylinder. This quite naturally increases the temperature at each succeeding stroke until it is sufficiently high to ignite the mixture of lubricating oil and air in the air lines and receivers, thereby causing an explosion. It follows, therefore that an oil so high in carbon content that it actually carbonizes at discharge tem-

* Lubrication Engineer, Sun Oil Company.

peratures is one of the main causes of explosions.

2. Badly worn valves, seats and broken spring, all of which permit re-compression or churning of the air.

3. Retarded water circulation through the water jackets.

4. Piston alignment that permits a small portion of the air to remain in the cylinders at the end of each stroke, thus increasing the internal temperature to a point where the lubricant is carbonized, and causing the valve troubles already mentioned.

A most common cause of air compressor complaints, and one that is not to be overlooked, is due to the compressing of air heavily loaded with foreign matter. This foreign matter mixes with the lubricating oil and is frequently the cause of sticky valves, re-compression, high temperatures and other difficulties experienced in the operation of air compressors.

Mine Haulage Equipment. Today this equipment consists principally of electric locomotives. These are operated under varied temperatures, water and dust conditions. To properly lubricate this type of equipment it is, therefore, necessary to take into consideration the following:

1. Type of bearing.
2. Temperatures encountered.
3. Condition of road bed.
4. Dust and water encountered.
5. Method of applying lubricant.

For bearings of the anti-friction type, greases are necessary. Where water is encountered, calcium base greases are required. Where temperatures are high, frequently a condition encountered on armature bearings, soda base greases are advisable. Where dust is present, it is a good practice to overlubricate so that the grease will work out along the shaft or axle and act as a shield against dust.

When grease is applied by hand or paddle, greases up to a No. 3 density may be used. When application is made by gun or pressure fittings, a grease no heavier than a No. 2 density should prove practical.

Waste packed bearings are the two general types, namely loosely packed and tightly packed bearings.

When loose packing is used, best results will be obtained through the use of 70 percent long strand, Wilton type carpet yarn approximately 12 in. in length, mixed with 30 percent of curled horse hair (mane or tail hair). This will furnish a soft resilient packing and carry the lubricant by capillary attraction to the bearing. The packing should, of course, be saturated with the fluid grease—a calcium base grease when water is encountered and soda base grease when high temperatures exist.

Loose packing is best suited for bearings that are lubricated from the top such as plain bearings on armatures or journal bearings where a dust condition is not a factor to be considered.

This type of packing is suitable where road bed conditions are good, also in boxes where the clearance between the axle and the box proper at the back end of the box is not excessive.

Tight packing requires long strand, Wilton type yarn, approximately 18 in. to 24 in. in length. At the back of the box, the yarn should be twisted tight and forced into position with a packing hook so that the yarn will be tightly packed into the opening between the axle and the box proper. The under section of the bearing and the end of the bearing should be packed tightly with this long strand yarn to keep the bearing free from dust and grit. This yarn requires the same saturant and resaturant as the loose type packing. However, this waste should be turned at regular intervals to prevent glazing of the yarn next to the journal.

Mine Cars. When lubricated with proper lubricant the draw bar pull of mine cars can be reduced as much as 80 percent as compared with cars improperly lubricated with cheap black oils and improper lubricants. In addition, proper lubrication will last from two to six months per application as compared with daily application of black oils and other unsuited lubricants. Grease prevents the corrosive action of mine waters, it acts as a seal, keeping out dust and dirt and it materially reduces lubrication costs.

Shaker Cams. For many years the lubrication of shaker cams employed in breakers has presented a trying lubrication problem. In the main, this has been due to the rough condition of the eccentrics and straps which in many cases are unmachined cast steel against unmachined cast steel. The cams are connected to heavy shaker screens that are subject to extreme overload which brings about excessive pressures on the shaker cam proper.

The method of lubrication is generally by means of compression grease cups, hand regulated, or mechanical grease systems, which maintain a continuous flow of lubricant to the cams at all times. The latter is recommended as a continuous flow materially reduces mechanical wear and power losses.

There is now available for shaker cam lubrication, a special grease, which possesses extreme pressure characteristics. This type of grease has proved to be a more effective lubricant for shaker cams. It reduces excessive lubricant consumption, keeps cams cooler, prevents excessive wear and lowers power losses.

Electric Motor Oils. Many coal breakers, especially in the anthracite field, depend on a main driving unit to operate the entire breaker. These motors very often will average from 250 to 750 h.p., and are equipped with ring oiled bearings. A unit of this type, therefore, is the heart of the breaker and should be thoroughly lubricated with a dependable high quality oil. The most satisfactory type of oil for this purpose is one that will withstand heavy pressures, high and low temperatures, will not oxidize or gum and one that can be used for long periods.

Reciprocating Mine Pumps. Mine water is highly corrosive and contains large quantities of silt of a highly abrasive nature, and as a result, the lubrication of reciprocating pumps is a matter requiring careful selection of lubricant. To prevent excessive packing wear and plunger wear graphite grease with a calcium soap base will prove most efficient. Grease of this type will repel water, preserve and keep the packing soft and more resilient. It will also adhere to the plungers.

Storage and Handling of Lubricants. Experience has proven that in many mines wastage is one of the biggest items in lubrication costs. To avoid this, all lubricants should be kept in a central storehouse, probably under lock and key. Each department should requisition the particular lubricants they require and these requisitions should conform with the schedule drawn up by a practical lubricating engineer. The storekeeper should maintain a continuous record that will indicate the withdrawal of the lubricants by the various departments so that wastage and requisitions for improper lubricants can be quickly checked.

There are many variables entering into the operation and lubrication of coal mining equipment. It is, therefore, impractical to set down a definite set of fixed rules that will cover the lubrication of all the various types of equipment employed in coal mining operations. Each mine property by reason of the service conditions encountered and type of equipment employed presents lubrication problems peculiar to that operation.

The oil company lubrication engineer, with his wide and varied experiences, working in conjunction with the mechanical superintendent or master mechanic and the mine personnel, can materially assist in the establishment and maintenance of good lubrication practices.

He can recommend the best type of lubricant for each particular purpose, set up lubricating schedules for the various types of equipment and work with the personnel to keep down power losses, maintenance and lubrication costs.

New Bulletin

The Mine Safety Appliances Company announces the publication of a well-illustrated new bulletin describing their MSA all-service gas mask (Burrell type). The mask is designed to provide protection against asphyxiation from combinations of carbon monoxide and all other poisonous industrial gases, fumes, and smoke. It is the only canister mask approved by the United States Bureau of Mines for this protection, and is widely used aboard ships, in mines, steel and chemical plants, gas and power companies, as well as a majority of the fire departments throughout the United States. Copies of this interesting and informative new bulletin, just off the press, are available by writing this magazine, or by addressing the manufacturer direct.

VENTILATING Efficiency—

By RAYMOND A. MANCHA*

AN interesting application of modern ventilating efficiency is that of an 8-ft. exhaust fan installed at the mine of a prominent coal company in the East. This fan, shown in the accompanying photograph, was placed in operation on May 4, 1937.

The outstanding characteristics of this installation are its high-pressure operation and the unusually high useful efficiency of the fan, as borne out by a precision test conducted on May 7, 1937, by representatives of the coal company and the manufacturer. The results of this test and the methods employed are tabulated and described in the table accompanying this article.

The normal mine pressure of 4.30 inches static depression is particularly impressive in that it is maintained with a single stage propeller fan. Whereas the 4.30 in. depression is maintained at a fan speed of 823 r.p.m., it is worth noting that a depression of 6.30 in. water is possible by merely increasing the fan speed to the maximum operating speed of 1,000 r.p.m. It should be further noted that these pressures are maintained handling air having a specific weight of 0.0730 lb. per cu. ft.

Whereas the overall useful efficiency of the installation (electricity to air) was determined as 77.0 percent by direct measurement, the useful efficiency of the fan, or 90 percent, is based upon assuming motor and drive efficiencies of 90 percent and 95 percent, respectively. Since the motor was operating near full load and rated voltage, the assumption of 90 percent motor efficiency is accurate. Because "C" type ropes were used in "D" type sheaves (a temporary mismatch since corrected) the drive efficiency assumption of 95 percent may be high. However, it is obvious that on either basis the fan is operating at a useful efficiency of at least 90 percent, which is a performance without precedent in this country.

It should be understood that, although large fans of a given design are more efficient than small fans of the same design, it is the policy of the Jeffrey Manufacturing Company to rate the performance of all Aerodyne fans, regardless of size, according to results of factory tests of a five-foot Aerodyne fan. This conservative practice insures results that exceed expectations and, it is felt, is the proper course to follow.

TEST DATA

Test Date

May 7, 1937.

Fan Tested

Jeffrey Aerodyne No. 8-96, operating exhausting.

Drive

Allis-Chalmers "V" Belt Drive consisting of one 14.2-in. "D" Groove Motor Sheave and one 15.0-in. "D" Groove Fan Sheave and nine "C" Belts.

Motor

General Electric, two-speed Induction Motor, serial No. 4822257, Model 1480-500, 3 phase 60 cycle, 220 volt, 100/33 1/3 hp., 880/430 r. p. m., 246/108 amperes, Type KT556Y.

Fan Speed

823 r. p. m. (5-minute recording with speed counter and stop watch).

Motor Speed

880.8 r. p. m. (5-minute recording with speed counter and stop watch).

Motor Input

90.0 kw. @ 220 volts (as measured by representatives of local power company using their own polyphase watt-hour test meter.)

Temperatures

Outside Air = 63° F., Return Air at Fan = 62° F. (Saturated).

Barometer

29.1 in. Mercury.

Specific Weight of Fan Air

0.07347 lb. per cu. ft.

Useful Pressure

4.3 in. water (static depression in collar of upcast airshaft at point 30 ft. below ground level).

Volume

137,170 cu. ft. per minute (measured in 110 sq. ft. area steel duct connecting fan to airshaft hood, based upon average of two 42-position anemometer traverses.)

Useful Horsepower In Air

$$\frac{137{,}170 \times 4.30}{6350} = 92.8 \text{ hp.}$$

Overall Useful Efficiency

$$\frac{92.8 \times .746 \times 100}{90.0} = 77.0\%$$ (Electricity to air).

Useful Fan Efficiency

$$\frac{77.0}{0.90 \times 0.95} = 90.0\%$$

Based upon motor efficiency of 90% and drive efficiency of 95%.

* Manager, Mine Ventilation Division, Jeffrey Mfg. Co.

A Market Requirement: CLEAN COAL

Presented by
Link-Belt Company
Allis-Chalmers Mfg. Co.
Jeffrey Mfg. Co.
Pursglove Coal Mining Co.
Hendrick Mfg. Co.
Deister Concentrator Co.

CLEANING and BLENDING Processes at Island Creek Coal Company

By THOMAS A. LINTON*

IN THE heart of the rich Logan County coal fields of West Virginia, the Island Creek Coal Company is operating three modern, high-capacity coal preparation plants. These washeries were erected and put into operation early in 1936 by the Link-Belt Company at Mines 14, 20, and 22 near Holden, W. Va. Each plant is capable of handling 500 tons per hour of run-of-mine coal, of which a maximum of 475 tons per hour of 5 x ¼-in. coal can be washed. The plants are of essentially the same design, so that a description of the flow (Fig. 1) of material in any one of them will, in the main, apply to all three.

Run-of-mine coal is screened on the main shaker screens into 5-in. lump, 5 x 2-in., and 2 x 0-in. After being hand picked, the lump coal is loaded directly into railroad cars. The 5 x 2-in. is delivered from the shakers into a raw coal conveyor to the washery. A gravity discharge elevator-conveyor carries 2 x 0-in. to a pair of vibrating screens which scalp off part of the ¼ x 0-in. coal. Oversize from the vibrators passes onto a pair of flexible-support fine coal screens which remove the balance of the ¼ x 0-in. and deliver the resulting 2 x ¼-in. coal into the same raw coal conveyor which carries 5 x 2-in. from the main shakers. Chutes are so arranged at the ends of the fine coal screens that any one of the three sizes, 2 x 1¼-in., 1¼ x ¼-in., and ¼ x 0-in., may be loaded raw without going to the washery.

The first washing unit to handle 5 x ¼-in. raw coal is the trough separator (Fig. 4). This is a 54-in. wide trough in which a freely flowing stream of water effects stratification. Two rotary gates, which may be driven at varying speeds through P. I. V. gear variable speed transmissions, are located in the

* Engineer, Link-Belt Company.

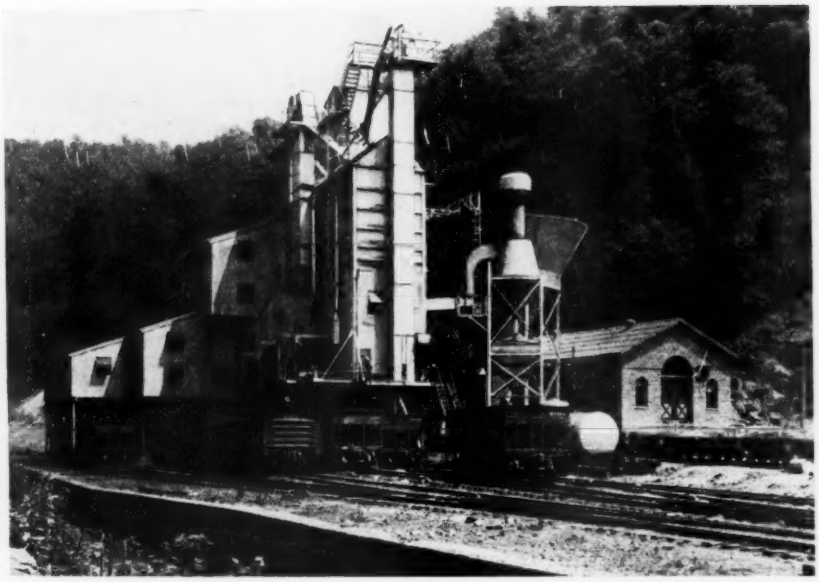


FIG. 2.—*Preparation Plant at Mine No. 14.*

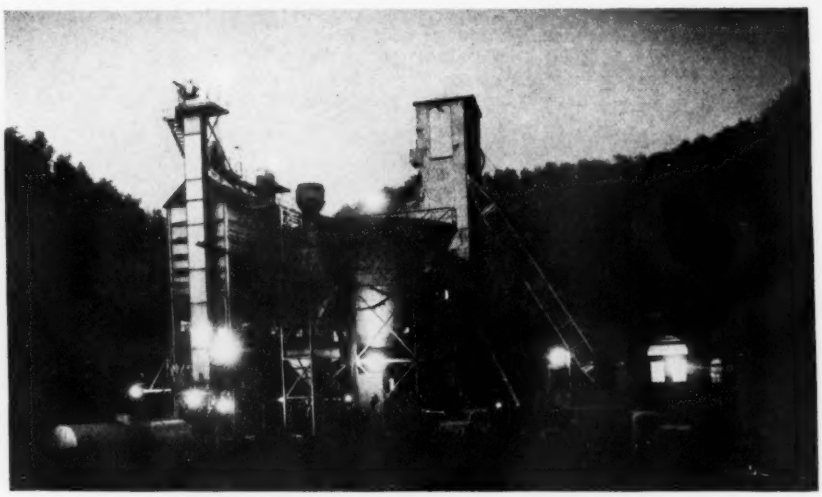


FIG. 3.—*Night Photo, Preparation Plant at Mine No. 20.*

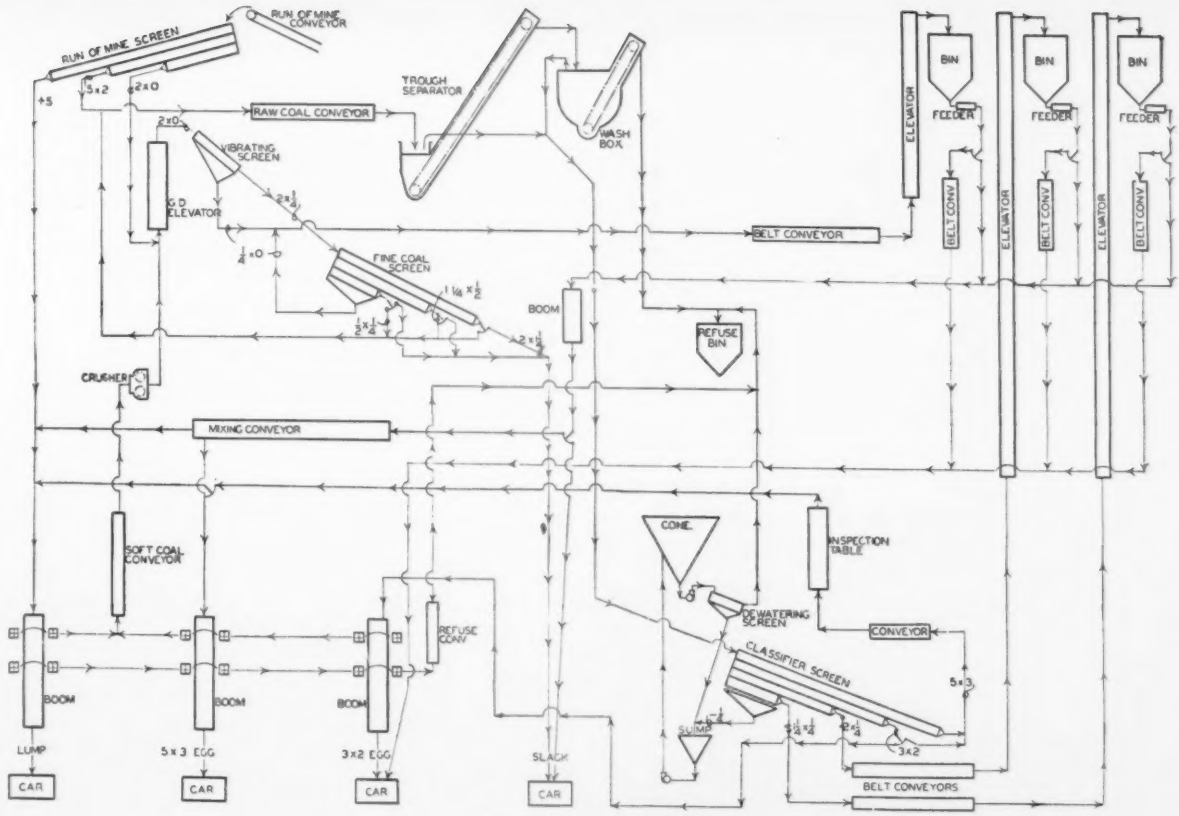


FIG. 1.—*Flow of Material.*

bottom of the trough to remove all of the high-gravity material and some of the coal.

All material passing through the gates is elevated by two perforated bucket elevators to a Simon-Carves wash box (Fig. 5) for the final separation. Clean coal overflow from the trough separator and the wash box is sluiced to a set of flexible hanger classifying screens, where it is sprayed and sized. On these screens 5 x ¼-in. clean coal is classified into the following sizes as the first step in the custom blending system: 5 x 3-in., 3 x 2-in., 2 x 1¼-in., and 1¼ x ¼-in. The first two of these sizes may be loaded individually or mixed with any or all larger sizes, as when loading washed and picked mine-run. The other two washed sizes, namely, 2 x 1¼-in. and 1¼ x ¼-in., as well as the ¼ x 0-in. raw undersize from the fine coal screens, are from this point handled separately and identically. They pass first to belt conveyors which lead to elevators. Each of three elevators discharges into a bin of 100-ton capacity through step-lowerators which keep degradation and segregation at a minimum. In order to take advantage of the length of time the washed coal stands in the bins, drainage gutters have been built into the bottoms of the bins ahead of the reciprocating feeders to remove any accumulation of moisture. To further guard against segregation, withdrawal chutes that take coal from

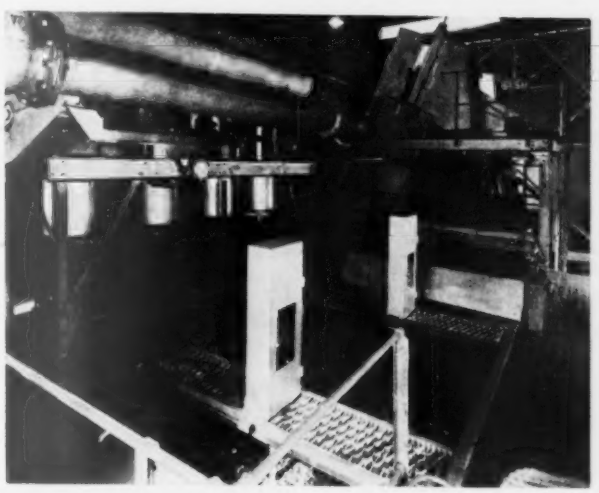


FIG. 5.—*Link-Belt Simon Carves Washery.*

the top of the bin have been arranged to discharge onto reciprocating feeders driven through P. I. V. gear variable speed transmissions. This arrangement permits the loading out of a uniform product at varying rates of speed. Bifurcated chutes beneath each feeder allow any one size to be loaded over a scraper type boom conveyor or by belt cross conveyors into cars on an adjoining track, or any combination of sizes to be loaded over the boom. By raising the boom and lowering the mixing gate, the 2 x 0-in., or any combination of its constituent three sizes, may be transferred to a belt conveyor and mixed with any one or all of the larger sizes.

The outstanding features of the plants are the system of cleaning the coal and the equipment provided for blending the products to meet individual requirements.

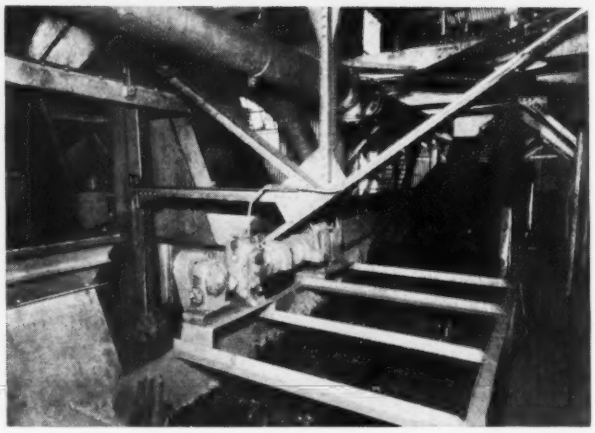


FIG. 4.—*Rotary Gates and P.I.V. Gear Variable Speed Transmissions.*

For the efficient cleaning of high tonnages of raw coal, the Link-Belt Company designed a trough separator to be used in series with its standard washing unit, the Simon-Carves wash box. Coal enters the trough in a stream of water which stratifies the material into layers of clean coal and rejects matter as it gently moves them down stream. At the first rotary gate the large and heavy refuse is drawn off. At the secondary gate the remainder of the refuse is rejected. It is not attempted to obtain a perfect separation in the trough so far as obtaining a refuse which is free of coal. However, the cleaned coal overflow is completely free from all high-gravity material and requires no further treatment except sizing. Each rotary gate discharges into a bucket elevator which carries the mixture of coal and refuse to a Simon-Carves four-cell wash box. Due to the extremely high efficiency of this unit, a raw coal with high-gravity content artificially increased by the trough separator can be fed to it with the utmost confidence of perfect cleaning.

The advantage of recirculation of the washing water always employed in the Simon-Carves system has been incorporated in this combination plant, so that the loss of water is only the small quantity carried away by the superficial moisture of coal and refuse.

These three installations at Island Creek are unique in the application of the Link-Belt wash box as a final cleaning unit following a scalping process.

Savings in Proper Selection of SCREENING Equipment

By JOHN E. DUNN*

THE selection of equipment for elevating and sizing of coal for new plants or modernizing existing plants is a subject of importance to all coal handling plants whether tipples, preparation plants, coal bridges, and others. This is especially true in view of extra expense being borne by the industry as a result of increased labor costs and other recent Government regulations. These new regulations and increased costs have placed a responsibility on the manufacturers of equipment which necessitates improvements and changes in the design of screening equipment to permit erection of compact structures or buildings and shorter elevators to obtain efficient screening at minimum expense of elevating the material and maintenance of equipment.

This trend was recognized by an early introduction of the low-head horizontal vibrating screen. This type of screen requires minimum head room, very low power requirements, and practically no maintenance expense, except replacement of wire cloth due to natural wear.

Since it is a fact that it takes 2/10 hp. (assuming 100 percent for friction loss) to elevate one ton of material 10 feet at a speed of 175 f.p.m., it will, on the same basis, take approximately 2,000 hp. per month to elevate 100,000 tons. This represents a very substantial outlay for power when considered over a period of years.

One of the outstanding recent plants that illustrates the effective use and saving due to the use of low-head screens is that at Dock No. 1 of the North Western Fuel Company located in Superior, Wis. Here two of these screens, shown in Figure 1, are installed in an existing movable coal bridge, this movable bridge and dock being the largest of its kind. This screening equipment which handles 340 tons per hour of Bituminous coal, is therefore of interest.

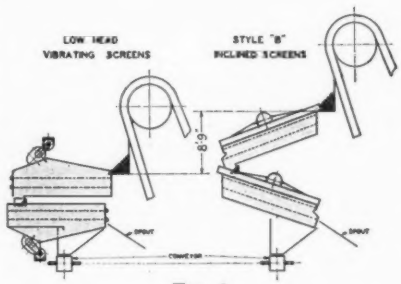


FIG. 3.
Diagram Illustrating Space Requirements of Screening Equipment.

The first screen consists of one 6-ft. x 14-ft. double deck low-head horizontal vibrating screen having two mechanisms driven by a 15-hp. motor through a texrope drive. This screen is equipped with a bottom plate below the second deck with slide doors to convey the undersize to the discharge end of the screen or discharge the undersize through the slide doors to fill the bins to the top. The top deck has 1¼-in. square openings, and the bottom deck has ¾-in. square openings. Following the 6-ft. x 14-ft. screen is a 6-ft. x 12-ft. single deck low-head horizontal screen equipped with one mechanism and driven by a 15-hp. motor through texrope drive. This screen is also fitted with a bottom plate and slide door.

This installation was made with minimum expense to the purchaser only requiring the installation of channels for suspending the screens. The elevator centers were not increased, nor was the building height increased. If the conventional type 20° inclined screens had been installed in this plant, it would have been necessary to lengthen the elevator 10 ft., to increase the height of the movable bridge, and to reinforce the bridge itself which would have cost several thousand dollars.

Figure 2 illustrates the exterior view of this movable coal bridge. The coal is delivered by water to the dock, and the bridge is capable of receiving, screening, and piling 9,000,000 to 12,000,000 tons of coal during any season of lake navigation. This giant coal bridge has an overall length of 715 ft. and a span from rail to rail of 551 ft. The bridge travels 90 f.p.m. and has a dock travel of 700 ft. Capacity of the bridge handling coal continuously is 600 tons per hour. It can handle when unloading vessel or boat about 6,000 tons in 10 hours.

Figure 3 gives another comparative illustration of the advantages of the low-head type of screens and the savings that can be made in a compact arrangement of this kind, requiring shorter elevators and reduced cost of elevating the material itself.

The screens indicated on the left of Figure 3 consist of a 5-ft. x 14-ft. and a 4-ft. x 14-ft. low-head double deck screens with bottom plates to convey the

* Allis-Chalmers Mfg. Co.

undersize of the lower deck from the feed end of the screen to the discharge end. Attention is called to the fact that the mechanism on the lower screen is located underneath the screen.

The screens indicated on the right of Figure 3 consist of 20° inclined screens of the same size, and it is to be noted that to spout the undersize from the lower deck of the lower screen on the present belt conveyor, it is necessary to equip this screen with a bottom plate. It will also be noted by referring to Figure 3 that to have used the 20° inclined screens would have necessitated raising the elevator head pulley 8 ft. 9 in.

At the plant where the low-head screens, shown in Figure 3, were installed, both the building and the elevator frame were of steel construction. If inclined screens had been selected, instead of low-head horizontal ones, it would have been necessary to increase the height of the building and to lengthen the elevator the 8 ft. 9 in. previously mentioned. This would have increased the initial cost of installation as well as requiring a considerable outlay for unnecessary power.

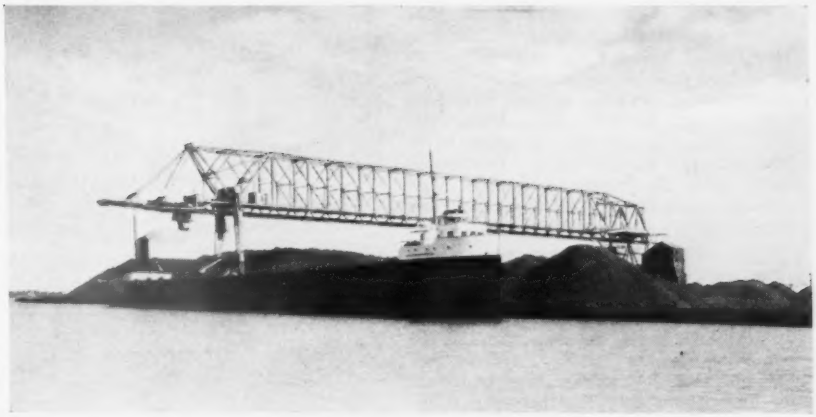


FIG. 2.—*Movable Coal Bridge.*

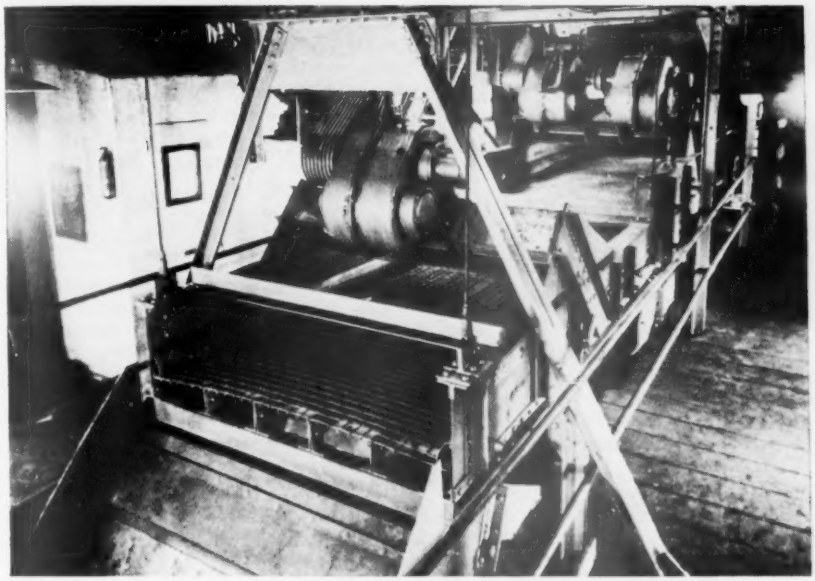


FIG. 1.—*Coal Screening Installation at Northern Fuel Co.*

In this last-mentioned plant, the openings in the wire cloth of their low-head screens varied from 2 in. on the top deck of the upper screen to ½ in. on the lower deck of the lower screen. In general, where the openings in the screens are not larger than 4 in. or even 5 in., the low-head type of screen would appear to be the proper selection, while for scalping screens, or for screens having openings larger than 5 in., the 20° inclined screen still has an important place in the coal industry.

Recent enactment of dust laws in cities and communities necessitates the use of enclosed type screening equipment. The Allis-Chalmers low-head screen can also be equipped with a dust-tight enclosure at a small additional cost to meet this requirement.

CLEANING PLANT of the Pursglove Coal Mining Co.

By GEORGE B. FLEGAL*

THE No. 2 Mine is located about three miles west of the Monongahela River on the Scotts Run Branch of the Monongahela Railway, in Monongalia County, West Virginia. The mine extracts coal from the Sewickley seam which is approximately five feet thick in this vicinity and has a total daily output of approximately 3,000 tons in two seven-hour shifts.

In 1936 the No. 2 Mine was converted from a hand-loading to a mechanical loading operation. Because of the frequent and almost continuous interbanding of high ash boney streaks in the Sewickley seam this basic change in mining methods required an immediate increase in the number of handpickers on the No. 2 tipple. Even though the picking force had been gradually increased until it had about doubled in size it was impossible to remove the large number of interbanded pieces of coal sent to the tipple from the loading machines, and in spite of this increase in picking table labor there was an appreciable increase in the ash of the shipped product.

The obvious solution to this problem was the installation of mechanical cleaning equipment, and the cleaning project, therefore, was considered from two angles: (1) reduction in tipple day labor costs, and (2) reduction of ash in the shipped product to a point equal to or below the ash shipped prior to mechanization.

After considering cleaning equipment for over a year, a contract was awarded on April 19 to the United Engineers & Constructors of Philadelphia, covering the construction of a 10-ft. dia. Chance Cone Cleaning Plant, and other changes and additions to the tipple to permit uniform mixing and blending of all sizes shipped to market.

The Sand Flotation Process was selected by the Pursglove Company as the correct cleaning equipment for the No. 2 Mine for the following reasons:

(1) A cleaning device was required that could efficiently handle a wide range of sizes including in the feed the large 6-in. egg and the fine 1¼-in. x ¼-in. pea.

(2) Because of the high percentage of relatively lightweight bone coal in the Sewickley seam, a very efficient cleaning process is required to make an accurate separation of clean coal from refuse. In such cases, an inaccurate process would cause excessive and very costly losses of good coal in the refuse should the operator attempt to produce an impurity-free clean coal for market.

The plant as now being constructed will provide facilities for cleaning in one cone approximately 160 tons per hour of 6-in. x ¼-in. coal which will be screened and rescreened, after cleaning,

* Chief Engineer, The Pursglove Coal Mining Co.

into washed egg, nut, pea, and small-pea. When required 4½-in. lump will be produced, during which times raw feed to the cone would be 4½-in. x ¼-in. When the lump size is not required it will be sent to a crusher and the crushed product rescreened, so that all plus ¼-in. material from the crusher will be cleaned in the cone. During these lump crushing periods approximately 82 percent of the mine output will be cone-cleaned coal.

Through the installation of a large new vibrating screen placed over the existing Marcus screen the fine raw ¼-in. x 0-in. slack may be mixed with any of the washed sizes in any required and definite percentage. Likewise, facilities are being provided for uniformly mixing all washed sizes with each other in any desired percentages, or with the lump coal for run-of-mine and special lump sizes. This flexibility will permit the loading of uniformly sized, special railroad stoker fuels, as well as special 2-in. nut and slacks and 1¼-in. nut and slacks for stoker uses, and eliminates batch loadings and guesswork mixtures.

When lump will be loaded the lump pickers will send lumps laminated with high-ash streaks direct to a crusher, from which the crushed material will pass to the cleaning plant. Pure rock or shale removed from the lump table will go direct to the refuse bin. In this manner all good coal is recovered from the lump pickings and is reclaimed as washed egg, nut, and pea.

Refuse from the cone after being dewatered and desanded will be carried to the existing refuse bin. The possibility of recovering coal from interbanded coarse refuse by crushing and recleaning was reviewed and the following procedure decided upon:

After the plant will have been in operation for a month or two, float and sink tests will be made on crushed 6-in. x 2-in. refuse to determine the percentage of good coal recoverable by recleaning this crushed material. If this test shows that sufficient coal can be recovered to justify the expense, a crusher and elevator will be installed whereby 6-in. x 2-in. refuse can be crushed to minus 2-in. and recleaned. Refuse screens are being installed in the new plant to permit this addition, if required, without any major alterations to the plant.

As this is the first commercial-sized installation of the Chance Process in the state of West Virginia, and, in addition to this, as it will be the first cleaning plant put into operation in the entire northern coal fields of the state, its construction is being watched with great interest by large numbers of operators.

The improvement in the quality of the Sewickley seam as shipped will go a long way toward maintaining its competitive position in eastern markets.

It is expected that the new plant will be in operation around September 15, 1937. The artist's sketch shows a view of the Pursglove No. 2 Mine tipple and the new cleaning plant as it will look when completed.

Cornett-Lewis Company Installs MODERN WASHERY in Harlan Field

By G. L. ARMS*

AN interesting development in the Harlan field in Eastern Kentucky is the starting up of the new washing plant of the Cornett-Lewis Coal Co., at Cornett. This mine is operating in the Harlan seam and while the coal is of excellent quality, bone and slate are encountered in sufficient quantity to make the smaller sizes analyze somewhat too high in ash for a competitive market. The decision to install a cleaning plant followed a long period of investigation, covering both the coal itself as well as various cleaning methods, and a plant was finally laid out to treat not only the smaller sizes but up to and including the 4-in. coal as well. The washer has been in operation since the middle of March of this year, and present indications are that the washed coal is meeting with a favorable reception in the markets to which it is applied.

In laying out the washer it was recognized that no definite prediction could be made as to what sizes would most appeal to the market, and that therefore the new plant must have the utmost flexibility in operation and be able to produce wanted sizes and combinations with a minimum of delay. In addition, the question of moisture gave some concern and resulted in a decision to by-pass the ⅛-in. x 0-in. fine coal around the washer without treatment.

The cleaning plant was built as an addition to the existing tipple. A raw coal conveyor was installed under the shaker screens and the necessary changes in the screen made to deliver 4-in. x 0-in. coal thereon. The raw coal conveyor carries coal up-hill to a sufficient height for discharge over a Jeffrey-Traylor vibrating screen and thence direct to the jig. The vibrating screen is equipped with woven wire screen cloth having openings ⅛ in. wide by about ½ in. long, and discharges the undersize to the bottom, or return strand, of the raw coal conveyor from where it passes to the loading boom on the slack track.

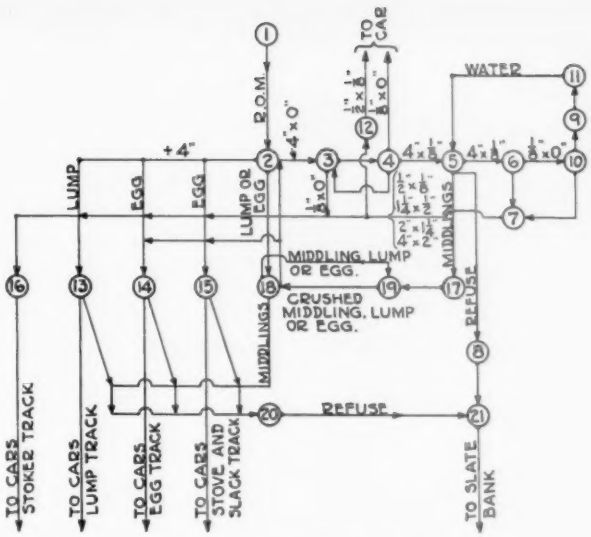
The jig is a two-compartment Baum type unit, wherein the pulsations are produced by compressed air admitted to pressure chambers over the surface of the water. The valves controlling the admission of the air are of special design to make it possible to control the rate of admission of air, and thus produce a differential stroke in the washing compartment.

Refuse from the jig is lifted out of the water by dewatering elevators and discharged to a refuse conveyor leading to the refuse bin in the old tipple. Owing to the presence of a considerable amount of bone in the larger sizes which adheres to the coal, a separate conveyor was installed for the reject from the second compartment, this conveyor discharging to a crusher alongside the primary shaker screen. After crushing these middlings can be returned to the feed to the washer for retreatment.

The washed coal from the jig, with the wash water, flows to a set of dewatering and classifying screens which separate the coal into 4-in. x 2-in., 2-in. x 1½-in., 1¼-in. x ½-in. and ½-in. x ⅛-in. sizes. Any coal passing through the ⅛-in. x 1-in. slots in the dewatering decks passes with the water to a concrete settling tank located at ground level, and is recovered as a sludge to be mixed with the slack coal.

From the classifying screens the washed and sized coal passes to a four-compartment scraper conveyor, extending across the loading tracks and with gates at each track which make it possible to discharge any or all sizes on any track.

* Engineer, Coal Preparation Division, Jeffrey Mfg. Co.



Flow Diagram for Tipple Equipment.

This feature provides the needed flexibility in operation and enables the operator to load any sizes or any combination of sizes at will.

At the same time the washer was installed a crushing arrangement was provided by means of which all of the lump and egg coal can be crushed into the smaller sizes. In this manner the plant as it now stands is almost entirely independent of seasonal changes in market demands, and can produce almost any grade of coal which may be in demand.

The erection of this type of washing plant in the Eastern Kentucky field promises to be a significant step, and will undoubtedly be an influence towards improving and stabilizing markets for the coal produced in this area.

FLOWSHEET LEGEND

1. R.O.M. belt from mine to tipple.
2. Primary shaker screens.
3. Scraper conveyor taking 4-in. x 0-in. raw coal to vibrating screen.
4. Jeffrey-Traylor electric vibrating screen for dedusting.
5. Two-compartment Jeffrey Baum jig.
6. Dewatering and classifying screens.
7. Four-compartment mixing conveyor.
8. Jig refuse conveyor.
9. Sludge tank and flumes.
10. Sludge conveyor removing sludge from tanks to mixing conveyor.
11. Pump and piping for circulating water.
12. Slack conveyor.
13. Lump picking table and loading boom.
14. Egg picking table and loading boom.
15. Stove coal loading boom.
16. Stoker coal loading boom.
17. Middlings conveyor from jig to crusher.
18. Scraper conveyor carrying lump or egg to crusher.
19. Crusher.
20. Refuse conveyor.
21. Refuse bin.

Perforated Metal SCREENS

By D. M. BLACKBURN*

IN the screening of coal, many different types of screens and screen surfaces are used. The type of screening surface is quite important in order to meet the many variable conditions encountered in the preparation of coal.

Perforated plates with round holes are used most extensively for the screening of coal. There are many good reasons why these round-hole screens are used. They size more accurately than any other shape of opening. They cause a minimum amount of degradation. They cause less blinding than other shapes of openings. This is especially true when the screens have a small pitch or on a horizontal screen. All anthracite coal and a large percentage of bituminous coal is screened over round-hole perforated plates.

A considerable amount of bituminous coal is screened over flanged-lip screens. These flanged-lip screens are made with a tapered perforation. The coal flows over the screens from the narrow end of the opening towards the wide end of the opening. Near the wide end is a step or lip. The tapering shape of the perforation together with the step allows this type of screen to clear itself readily and thus prevent blinding. Originally these lip screens were made with long slots and were designed to take the place of bar screens. While the long slot-lip screens are still used to some extent, most of the lip screens used at the present time are the short slot-lip screens. These short slot-lip screens are designed to give a product equivalent to round-hole screens. These short slot-lip screens are made in practically all sizes. The smallest size is the equivalent of 1/32-in. round mesh, and the largest size equivalent of 12-in. round mesh. The smaller sizes of these lip screens are used to a large extent for de-watering screens. They make ideal screens for this purpose. Lip screens keep the mesh clear and have a large percentage of open area. Degradation is reduced to a minimum on this type of screen and the step or lip disturbs and tumbles the mass, thus giving more efficient screening.

Square holes are used to some extent in the screening of bituminous coal. This shape of opening has slightly larger percentage of open area than round holes, however, it does not size accurately and does not clear itself readily.

Other shapes of openings used in the screening of coal are: rectangular, slotted, oval, squaround, hexagon, and diamond.

Most of the screen plates are made from steel. Coal is not highly abrasive and steel plates make good screens. On the smaller sizes, especially where the coal is damp or wet, non-ferrous metals and stainless steel are used extensively for screen plates. When screens are made from thin metals, they should be fastened securely to the screen frames, and should be supported properly to prevent sagging. If a thin metal screen is secured to the screen frame properly, it will last a long time. However, if it is allowed to whip very much, the screen will crack long before it is worn out.

The screening of coal is subject to many variable conditions and in almost every operation more or less experimenting is necessary in order to obtain desired results. The manufacturers of screening equipment are making many applications of their product in various fields and the experience gained by these manufacturers is readily available to the operators for the solution of their screening problems.

* Production Manager, Hendrick Mfg. Co.

An Application of CONCENTRATING TABLES to Cleaning of Glass Sand

By D. N. GRIFFIN*

ONE of the lesser known but highly valuable uses for Concentrating Tables is in the removal of iron from glass sand. For this purpose they have been found entirely satisfactory, and so far as is known, they offer the best and cheapest means for the elimi-

* Chief Engineer, the Deister Concentrator Co.

nation of iron bearing minerals found in a free state in the sand. Generally speaking, these minerals are the various oxides of iron and the mineral ilmenite. Any other heavy minerals present, such as rutile, will also be removed.

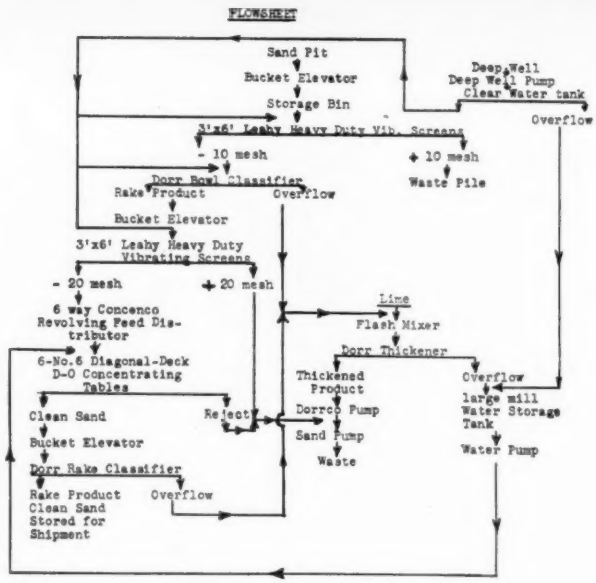
Iron occurs in glass sand either in the form of free mineral or as a stain on the surface of the sand particles. A well known acid bleaching process performs an excellent job in the removal of iron stain and costs are entirely within reason. However, the presence of solid particles of free iron minerals tremendously increases the time of bleaching and, consequently, the cost. Therefore the quick, cheap and easy elimination of these minerals by the concentrating table renders the use of this device essential. If all iron is present in the form of free mineral, the concentrating tables alone will complete the job.

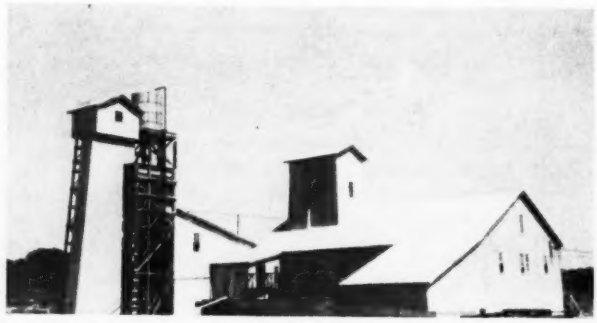
In few, if any, of the many applications of the concentrating table are the specifications of the products so exacting as in the case of the cleaning of glass sand. At the most, only a few hundredths of one percent iron, calculated as Fe_2O_3, are to be removed. When properly carried out the separation is a simple one. Obviously, however, when dealing with a separation in which thousandths of one percent of the contaminating material are of major importance, great care must be exercised in operation and, most important, the separating equipment must be of proper design. Actual operating experience, much test work and other confirmatory data indicate that best results can be achieved through the use of a concentrating table equipped with a deck of rhomboidal shape, commonly called the Diagonal Deck. Longer length of feed travel and the greater number of working riffles are important factors.

A splendid example of the application of concentrating tables to the cleaning of glass sand is found in the recently completed plant of the West-Land Security Company, Incorporated. This plant is located at Tarbutton, Tex., approximately 20 miles south of San Antonio. The company furnishes sand to glass makers in the United States and Mexico.

During July of 1936 a sample of the untreated sand was submitted to the laboratory of The Deister Concentrator Co., for testing. This sample contained iron in amount of approximately 0.1 percent Fe_2O_3. Laboratory investigation disclosed that by the use of proper desliming and tabling methods, a treated sand containing approximately 0.06 Fe_2O_3 could be produced. It is known that the acid bleaching process will reduce the iron content of the table treated sand to between 0.01 percent and 0.015 percent Fe_2O_3 which renders it suitable for the manufacture of flint glass.

Based on the laboratory testing the following flow sheet was laid out and the plant was erected in accordance with its provisions. Deister Concentrator Co. furnished the major equipment. Bowl and rake classifiers and thickener were furnished by The Dorr Co. This Classifier is equipped with Critical Size Control which permits very close regulation of the maximum size of particles in the overflow. In this instance the material is deslimed at 100 mesh. Plant erection was under the supervision of E. J. Haley, Construction Superintendent for The Deister Concentrator Co.





The raw sand feed to the plant is 98 percent minus 28 mesh. Contained in it, however, is a considerable amount of miscellaneous debris, principally roots. A ten mesh scalping screen is used to remove this material immediately ahead of the Classifier. Between 10 mesh and 20 mesh there is approximately 1 percent of heavily stained sand. This is removed the Feed Distributor. Both vibrating by the screen immediately ahead of screens are of the Heavy Duty type and are equipped with Water Sprays. These sprays give true "Sheet Flow" washing and assist the screens in producing the highest possible screening efficiency. The Revolving Feed Distributor produces an equal distribution of feed to the tables.

The distribution of water is shown on the Flow Sheet. This is rather complicated and is so for definite reasons. Only 75 gallons of water per minute are available from the deep well and this may decrease in time. Consequently, water must be recirculated. All overflows are clarified in the Thickener and returned to the large mill water storage tank. The use of lime is necessary for complete clarification. Obviously, this limed water cannot be used in the Classifier when desliming is the object. The answer to the problem is for the fresh water from the well to go to a small tank which supplies the Classifier and the Water Sprays. Table dressing water comes from the large mill water storage tank.

The plant has but recently been placed in operation. Sufficient time has not elapsed for the determination of maximum possible results. Due to an acute shortage of sand at the consuming points, it was necessary to place the plant into full time operation under an overload condition and without the usual tuning up period. During the first week's operation under the above noted conditions and operating with a green crew, excellent results were achieved.

Feed to the plant contained 0.116 percent Fe_2O_3 and shipments of finished sand in carload lots averaged 0.005 percent Fe_2O_3. The finished product is within 0.005 percent Fe_2O_3 of the anticipated figure and the actual iron extraction is better than that shown by the laboratory test. In the light of the foregoing, it is confidently expected that as operating technique improves the results will be considerably better than were originally anticipated.

Dumping Action 2 cu. yd. "Flare" Bucket, Marion Type 361 Dragline.

Modernizing the STRIP PITS

By L. C. MOSLEY*

THE measure of worth on any power shovel or dragline is indicated by its ability to dig and dispose of material at the maximum profit to its owner. Manufacturers are constantly alert to this situation and the shovel and dragline builders are busily engaged in anticipating requirements and cooperating with users by developing equipment to handle materials in greater volume and at lower unit costs.

Shovel Dippers

The earlier shovel dippers were crude and poorly-constructed tools when compared to parts of the same kind that came later. Plate steel formed the shell and body of the dipper and the various parts were riveted together to make a complete unit. Such construction met the requirements of fairly easy digging in a satisfactory manner, but, as more power was made available on the shovel and as rock and other heavy digging were encountered, the dippers proved inadequate to the jobs.

Then came a long era of dippers built to stand heavy and severe digging with low maintenance and low replacement costs. These dippers consisted of manganese steel fronts, cast steel backs, heavy door construction, and other parts of similar construction to give low maintenance and long life to the dipper. Low maintenance and long life were obtained, but at the expense of an increased "dead" load and a resulting decrease in "live" or pay load. Since the capacity of a shovel is based on its ability to handle the total weight of dipper and load, it is self-evident that if the weight of the dipper is relatively high, the weight of the load must be relatively low. Conversely if the weight of the dipper is decreased the weight of the load may be increased without imposing any more work on the operating machinery.

Aluminum Alloy Dippers

In 1934, to increase the production of coal, the Northern Illinois Coal Corporation, operating near Wilmington, Ill., found it necessary to obtain greater stripping capacities than could be handled by its Marion Type 5480 electric shovels, which were equipped with 12-cu.-yd. cast dippers. The most obvious way was to purchase larger shovels, but this would have entailed tremendous expenditures for new equipment, expenditures that could hardly have been justified economically. The alternative was to design and build dippers of higher capacities and lighter weights that would carry greater "pay" loads and thus increase the capacities of the existing shovels.

As a result of this situation, The Marion Steam Shovel Company, in cooperation with The Aluminum Company of America, designed and built a 16-cu. yd. aluminum alloy dipper for use on one of the Type 5480 shovels to replace the 12-cu.-yd. cast dipper. Subsequently, other dippers of the same general design have been applied to all the Type 5480 shovels on this property. The first aluminum alloy dipper was placed in operation in August, 1934, and now, June, 1937, this dipper is still in service and operating satisfactorily. The interesting fact about this installation is that it was possible to increase the dipper capacity of the Type 5480 shovel 33 1/3 percent without imposing any greater load on the shovel than when fitted with the 12-cu.-yd. cast dipper. Actual production was increased 35 percent by the use of the aluminum dipper, due partly to the increase in heaped capacity of the dipper.

* Marion Steam Shovel Co.

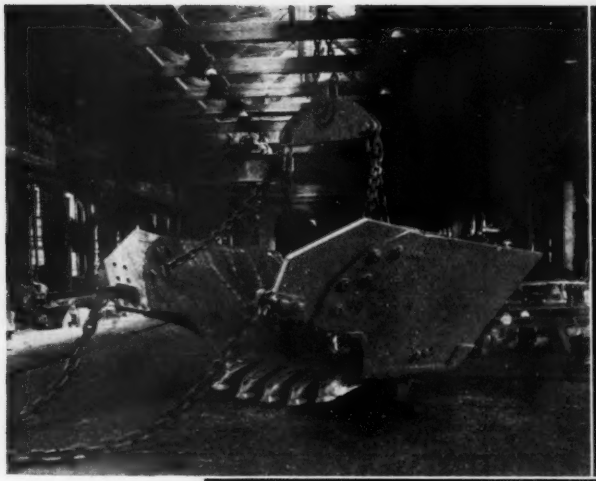


FIG. 6.—8½-*cu.-yd. "Flare" Type Dragline Bucket.*

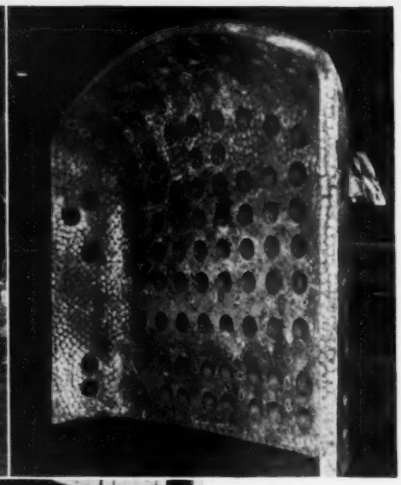


FIG. 7.—*Aluminum Alloy Bottom of Dragline Bucket.*

FIG. 1.—(*Right*) *Comparison between 32-yd. and ¾-yd. Dippers.*

Later developments include aluminum alloy dippers for stripping shovels ranging in size from 8 to 32 cu. yd., many of which are replacements to increase the capacity of shovels already in service and equipped with cast dippers. A number of coal-loading dippers, ranging in size from 3 to 7 cu. yd., have also been made of aluminum alloy.

The general construction of the dipper for coal stripping includes rolled plates and sections together with aluminum and manganese steel castings. The double-wall back is a combination of aluminum castings and plates and consists of two plates, separated by spacer castings and bolted together. Aluminum castings for attaching to the dipper handle are bolted to the dipper back. Rolled aluminum alloy plates form the front and sides and a manganese steel casting, extending back on the sides for mounting the bail pins, forms the lip. The inside of the front and sides is lined with ¼-in. steel plates; the front and part of the sides are covered with ¼-in. steel plates and a wearing bar is attached to the front and sides near the bottom—all to protect the aluminum plates from abrasion. The bail may be an aluminum forging, a fabricated structure of aluminum alloy or steel shapes or a steel cable, depending on the size of the dipper and the details of design. The hinges are aluminum alloy castings and the door is aluminum plate with renewable lining. Figure No. 1 shows a 32-cu.-yd. aluminum alloy dipper when compared to a ¾-cu.-yd. dipper.

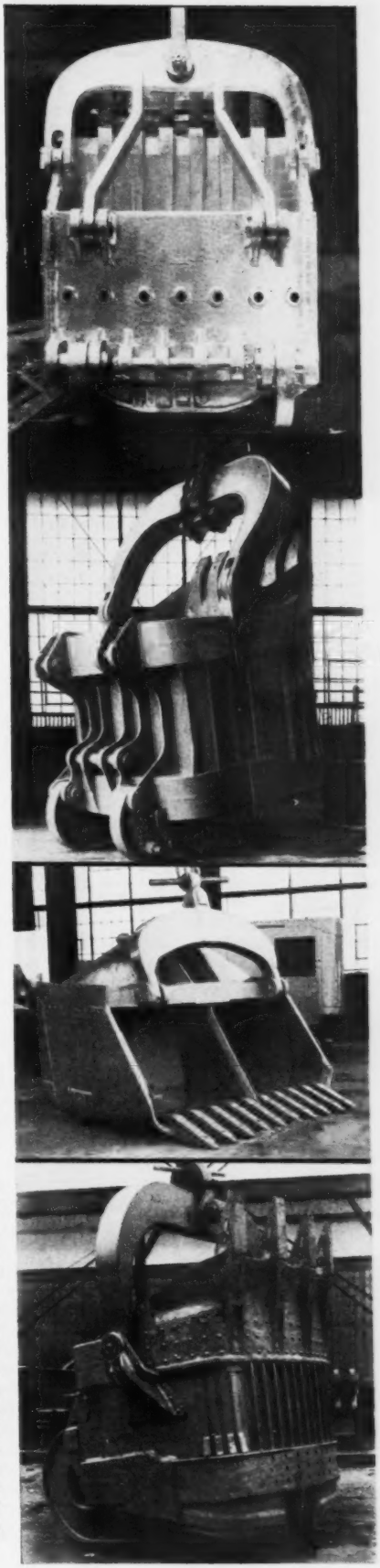
The dipper for coal loading is somewhat different in construction. It consists of aluminum alloy castings for the back and door hinges, a forged aluminum bail, a single aluminum plate for the front and sides, and a steel plate lip for attaching the teeth. The outside of the front and sides is covered with ¼-in. steel plate and steel wearing bars are provided at the top and bottom of the front and sides. Since coal is not highly abrasive, dippers for this service are not steel lined. Figure No. 2 shows a 7-cu.-yd. coal-loading dipper made of aluminum alloy.

Welded Steel Dippers

Recent developments have been made in the use of high tensile welded steel dippers for coal stripping and loading shovels. Experience has shown that it is possible to obtain approximately 25 percent increased dipper capacity on these shovels by the use of welded steel dippers instead of cast dippers of conventional design.

Figure No. 3 shows a 26-cu.-yd. welded

FIGS. 2, 3, 4, and 5.—(*Top to bottom*) *Views of Various Types of Dippers in Use in the Mining Field.*



steel dipper for use on a Type 5560 electric shovel, originally equipped with a 20-cu.-yd. cast dipper. All major parts of this dipper, except the lip, teeth, and bottom band, are made of high tensile rolled sections, welded into a substantial unit construction. Brackets, lugs, and ribs are cut from rolled sections and welded in place to give the required strength and rigidity for supporting the body or shell and for attaching the dipper to the handle.

A special 7½-cu.-yd. coal-loading dipper, for use in thin veins on a Type 4121 in the Northern Illinois coal fields, is shown in Figure No. 4. This dipper is made of high tensile structural steel riveted and welded into a complete unit. Since coal is not as abrasive as overburden, the lip and bottom band are made of steel plate and not cast manganese as on the stripping dipper. Because of the width of this particular dipper, a spacer or diaphragm plate has been welded in the middle, as is shown in the illustration.

Another recent development has been the welded steel dipper for use in open-pit copper and iron mines. Heretofore, in general, such work has been considered too difficult for any design of dipper other than one with a cast manganese steel front and a cast steel back. Recently, however, the Utah Copper Company at Bingham Canyon, Utah, has installed several Type 4161 electric shovels with 5-cu.-yd. welded dippers. These dippers are handling well-shot copper ore and recent reports indicate that the dippers are meeting the duty in a satisfactory manner.

Figure No. 5 shows one of the 5-cu.-yd. dippers used on the Utah shovels. The bail, dipper body, bail brackets, lugs, doors, and hinges are welded structural steel; the lip, teeth, and bottom band are cast manganese steel—the same general design, but heavier construction, as is used on the dippers for coal-stripping service. It is interesting to note that the welded dipper may, to a considerable extent, replace the conventional design of cast dipper heretofore used in such work.

Dragline Buckets

Probably the latest development in dragline buckets is the "flare" type bucket developed by R. S. Weimer, of the Northern Illinois Coal Corporation, and built for his company by The Marion Steam Shovel Company. Figure No. 6 shows a shop view of an 8½-cu.-yd. bucket of this kind, that has replaced a 6-cu.-yd. bucket of conventional design on a Type 360 dragline.

The bottom of the bucket consists of an aluminum alloy bowl, shown in Figure No. 7, which is covered top and bottom by plate steel to resist abrasion. The sides and back are made of steel plates and the digging lip and teeth are manganese steel.

There are three outstanding features of this bucket that differentiate it from buckets of conventional design. First, it has no arch, which helps to keep the weight down; second, the sides are flared, which permit greater heap loads; third, it dumps backwards and not forwards, and thus in effect gives a somewhat longer dumping range for a fixed boom length. Figure No. 8 shows the dumping action of a 2-cu.-yd. "flare" bucket on a Type 361 dragline.

The general trend today is definitely toward reduced dipper and bucket weights and a consequent increase in capacity in order to carry greater pay loads. Progress has been made along these lines and results are being obtained that show the wisdom of such developments made thus far. Where the character of the material is such that light-weight dippers and buckets can handle it, there is no cheaper way to obtain increased capacity than by their installation.

It should be borne in mind that on light-weight dippers and buckets, wear may be more rapid and maintenance and replacement costs higher than on the same parts of heavier conventional designs. Users or prospective users should take this into account and keep in mind that the increased maintenance or replacement costs should be more than offset by increased yardage, or else there is no merit to using the lighter construction. The general plan of The Marion Steam Shovel Company has been to incorporate sufficient material and strength into the light-weight dippers so that the upkeep and replacement cost will not exceed the savings resulting from increased outputs.

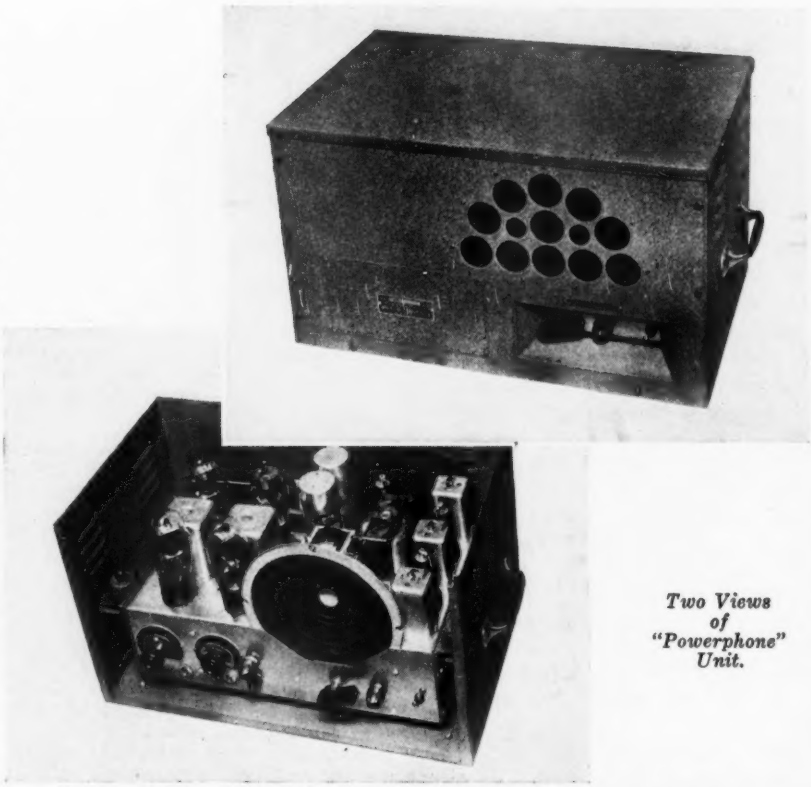
Records show that there is a definite advantage to the use of light-weight dippers and buckets, based on experience obtained from actual operation. It should be understood, however, that these new dippers and buckets are not considered universal applications and there are doubtless some jobs that require the heavier conventional designs and on which the lighter construction should not be used. The policy of the company has been to proceed cautiously in applying these developments to new operations and jobs. In this way, experience accumulated from existing installations serves as a guide in recommending and applying these late designs to the wide variety of specific and general-purpose excavating problems.

A New COMMUNICATION SYSTEM for Mine Use*

EFFORTS to provide a communication system for mine use have been directed along many lines. Hand operated signals, air "bells," speaking tubes, electrically operated lights and signals and the telephone have all found general usage. At the present time practically all systems consist of the telephone supplemented by these various other devices.

The development of radio has now afforded another system, the "Carrier-Call Powerfone," based upon radio principles which uses the power supply wires for transmission. The units are portable, loud speaking, telephonic devices which allow two-way conversation over considerable distances by merely connecting them to the power circuit. Speech is conveyed on the power supply wires from any transmitter to all receivers at whatever point they may be connected. A unit consists of a transmitter-receiver combination with a lever on the front panel that is used to switch the unit from listen to talk. The transmitter is designed to hold frequency with a minimum of drift due to the changing line conditions and will maintain a steady power output. The receiver combines the most desirable features of super-heterodyne and tuned radio frequency circuits to suit the exacting conditions under which it will operate. The units have two cables with heavy clamps on the ends for connection to the power circuit. If they are to be used on a motor, one cable is clamped to the frame and the other to a convenient place on the trolley pole.

Experiments with this type of communication have been made at several mines in West Virginia, but principally at the mine of the Nellis Coal Corp., Nellis, W. Va. Tests were made over distances up to three miles at Nellis with satisfactory results. Most of the tests being run with one unit at the lamp house at the mouth of the mine. The same units at other locations functioned well over four miles, the end of the line, without being turned to full volume and could be heard within a radius of 100 feet. These latter tests made it well apparent that under proper conditions and clear lines there is no practicable limit to operation of this type of communication unit.



Two Views of "Powerphone" Unit.

Automatic volume control circuits compensate for variations in tests and fluctuations in mine voltage, while a type of choke device and a specially devised noise suppressor circuit imposes a permanent barrier to line noise.

With an eye towards safety, the advantages of a loud speaker giving orders and warnings can be readily appreciated. From a dispatching standpoint such a system is indispensable. As an illustration of how time is saved take the following sequence of events. Number three and four faces are being worked. Each face is 4,000 feet from the main hallway. Number three has a slight breakdown on its loader and as a result almost all the empties brought in previously are still empty. On the other hand number four face has done a good job, has finished loading and is waiting for more empties. In the normal course of events a trip will be made to each face in turn, with time wasted on one trip, and time lost due to idle men on the other. However, if there were a Powerfone at each face and one on the motor, it would be no trick at all for the operator at each face to inform the motor of their status while the motor is still on the main line. Due to the fact that a unit can be installed on a motor and used while the motor is enroute, necessary information can be instantly conveyed at any time.

It is believed that this system of communication, due to its flexibility, portability, and efficiency will be found increasingly useful and necessary to efficient mine operation.

* Compiled from data furnished by S. R. Hert, American Carrier-Call Corp.

CRUSHING PLANT at CLIMAX

(Above) Crushing Plants and Mills of Climax Molybdenum Co. at Climax, Colo.

(Left) The No. 2 Crushing Plant at Climax, Showing Screen House in Foreground and Conveyor Galleries to and from the Crushing Plant.

By W. L. FEWSMITH*

THE mine, crushing plants, and mills of the Climax Molybdenum Company are located about two miles above sea level at Climax, Colo. The rarified atmosphere at this elevation is conducive to a minimum of manual labor and a maximum of mechanical handling of ore.

Until the spring of this year, the output was limited by the capacity of the No. 1 crushing plant. In order to bring the capacity up to 1,000 tons per hour of minus ¼-in. ore, the No. 2 crushing plant was built. This fine ore is fed to mills which grind it to about 100-mesh for delivery to the flotation system for extracting the molybdenite.

The new crushing plant, in its brief period of operation, has shown efficiency and economy in providing the increased capacity.

Run-of-mine ore, arriving in mine cars, is dumped into two coarse ore bins of 1,000-ton capacity each. These bins have gates and Ross feeders for regulating the flow of ore to a pair of 48 x 60-in. jaw crushers, which reduce the ore to about 6-in. maximum size. Above each crusher a set of grizzly bars with 6-in. openings permits much of the fine ore to by-pass the crusher. The minus 6-in. ore from the crushers and the by-pass chutes is received by a pair of 48-in. Robins-Oro manganese steel apron feeders. Each of these feeders is 13 ft. 6 in. long and has a capacity of 500 tons per hour. They discharge 1,000 tons per hour of ore to a common central chute feeding the lower end of an inclined 54-in. belt conveyor No. 21. The comparatively slow transit of ore on the apron feeders gives an opportunity for picking off pieces of timber, broken grizzly bars, and other refuse from the ore.

This conveyor No. 21 is provided with a magnetic head pulley for extracting tramp iron, and is further safeguarded by an electro magnet hanging close above the stream of ore at about the middle of the conveyor.

Due to the fact that the minus ¼-in. ore is of a rather sticky nature and has a tendency to make trouble through balling-up in a crusher, it was highly desirable to screen out or separate as much as possible of this minus ¼-in. ore before delivery to gyratory crushers. This is accomplished by delivering the product of belt conveyor No. 21 to a single-deck gyrex screen, 6 ft. wide and 10 ft. long, having its deck constructed of grizzly bars with 2¾-in. openings. The overs from this screen are divided into two streams and delivered to two 7-ft. standard gyratory crushers set to make a product of 1¼ in. maximum. The throughs from the first gyrex screen pass over a second gyrex screen, 6 ft. wide and 12 ft. long, having two decks, the upper deck being merely a protection for the lower deck, which has ¼-in. openings for final sizing.

The product of the 7-ft. standard crushers and the overs from the second gyrex screen are combined and carried over a series of 36-in. belt conveyors which eventually distribute this ore by means of a rope-hauled tripper into an ore bin of 60,000-ton capacity. This ore bin thus contains ore of a maximum of 2¾ in. The throughs, which are minus ¼-in., from the bottom deck of the second gyrex screen are taken by a series of belt conveyors Nos. 26, 27, and 28 to the existing conveyor No. 10 above the fine ore bins.

Under the 60,000-ton ore bin a series of 25 belt feeders draw off the ore to a series of gyrex screens, making a final separation at ¼ in., the throughs being delivered to the series of conveyors which lead to the fine ore bins. The overs from these screens are collected on five 36-in. belt conveyors delivering to five 7-ft. short-head gyratory crushers set for a maximum product of about ¾ in. This product from the five short-head crushers is collected on a 48-in. belt conveyor, joining the ore which has passed through the first screen and over the second screen in its circulation to the 60,000-ton ore bin, thus making a completely closed circuit. The conveyors in this closed circuit which handle the recirculated ore have a capacity of 2,500 tons per hour in order to produce a final volume of 1,000 tons per hour of minus ¼-in. ore.

All of the belt conveyors which handle

(*Concluded on page 74*)

* Engineer, Robins Conveying Belt Co.

State Chairmen

Wm. Koerner

W. H. Eardley

J. A. Caselton

Chas. M. Chapin, Jr.

Herbert S. Salmon

J. C. Kinnear

Robert Linton

Metal Convention

SALT LAKE CITY, the geographical center of the intermountain region, will be the scene of the annual Metal Mining Convention and Exposition of the Western Division, American Mining Congress, September 7-10, 1937. This meeting will bring together executives, operating men, and manufacturers of mining machinery and supplies from all parts of the country in one of the largest and most significant mining conventions ever held.

A nation-wide committee headed by Guy N. Bjorge, general manager, Homestake Mining Company, Lead, S. Dak., is arranging a program which will include addresses and discussions on many of the outstanding problems before the industry today. On June 16 this committee met at Salt Lake City to formulate general plans for the convention.

Among the topics selected for discussion were: Monetary Policies and Their Effect Upon Gold and Silver; Mining Tax Problems, including Depletion, the Undistributed Earnings Tax and Increased State Taxation; Government Regulation of Hours and Wages; Stream Pollution Legislation; the Securities and Exchange Act and its Administration as applied to the Mining Industry; the Proposed Withdrawal of Public Lands from Mineral Entry; Labor Relations, as Affected by Recent Federal and State Legislation; the Industrial Situation and Outlook; Ventilation, Air-conditioning and Dust Elimination in Mines and Metallurgical

Mining Progresses

Plants; Foreign Trade and Tariffs; Building Roads to Prospective Mining Areas; Mechanical Loading or Mucking; Economics of Small Milling Plants, and New Developments in Ore Concentration. Addresses on these subjects will be presented by men distinguished in the mining world and in public life.

A substantial part of the program will be devoted to mining and milling problems. Also of special interest to the operating man will be the extensive exposition of mining machinery and supplies, with displays by leading manufacturers of all types of equipment. This promises to be the largest exposition of metal mining machinery ever held, with most of the available exhibit space already under contract.

Four days, Tuesday, September 7 to Friday, September 10 will be devoted to the convention and exposition. Saturday and Sunday, September 11 and 12, will be devoted to inspection trips to the various important mines and metallurgical plants in the Salt Lake Valley.

Featured entertainment for each night is being arranged by the local committees and will include an open air welcome and dinner dance at the Salt Lake Country Club, a barbecue in the Wasatch Mountains, and the annual banquet which has become a real highlight of these conventions.

A cordial invitation to attend this meeting is extended to mining men throughout the country.

Guy N. Bjorge
National Chairman

M. C. Lake

John G. Barry

Ross D. Leisk

Milnor Roberts

J. D. Mackenzie

Mechanization Trends

Reports of Coal Operators Committees

Report on COAL SCREENING

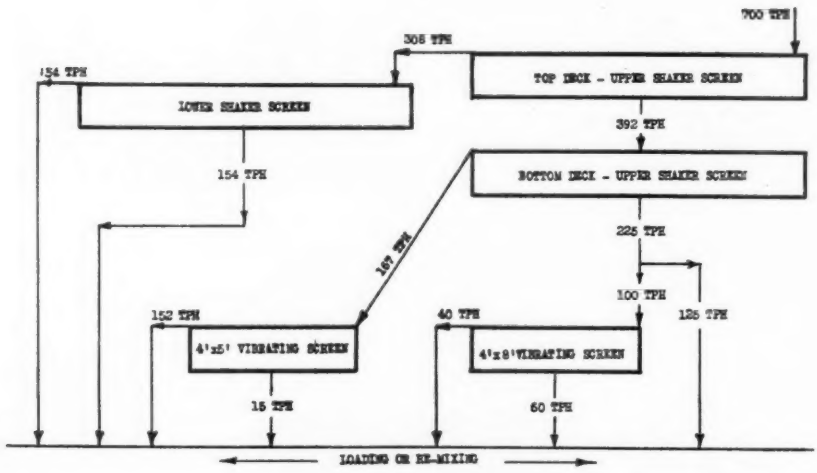


DIAGRAM OF SCREENING ARRANGEMENTS

THE following data covers the screening practice and performance at a mine in the Pittsburgh seam. The mined coal has a pronounced cubical fracture with a more or less even free moisture content averaging about 3 percent but varying from 1.5 percent to some dumps to high as 6 percent. The shatter test left 48 percent remaining as 4 in. lumps while grindability tests gave 59 percent (Hardgrove) and 58 percent (Yuma).

SCREEN ANALYSIS OF FEED COAL TO SCREEN

Plus 4"	Round Hole	22%
2" x 4"	Round Hole	22%
1" x 4"	Round Hole	21%
⅜" x 1"	Round Hole	15%
⅜" x 0	Round Hole	20%

SCREENING ARRANGEMENTS

Unit No. 1 consists of a double deck upper shaker screen which receives the run of mine coal at the rate of 700 t.p.h.

The distance vertical between the upper and lower screens is 13 in. while the lower screening surface is advanced horizontally 8 in. ahead of the upper screen.

Unit No. 2 consists of a single deck lower shaker screen which receives coal from the upper shaker at the rate of 308 t.p.h.

Both of the above screens, mounted on horizontal rollers, are mechanically driven by an a.c. motor at the rate of 103 strokes per minute. The 6-in. stroke is a simple harmonic motion with no quick return features.

Unit No. 3 consists of a 4-ft. by 8-ft. vibrating screen (4 vibrators) in which the screen motion is separate from the main screen body. The screen motion is imparted by a.c. solenoids giving a stroke of 5/64-in. perpendicular to the screen surface with a frequency of 1,800 per minute.

Unit No. 4 consists of a 4-ft. by 5-ft. vibrating screen (single vibrator) in which the screen motion is separate from the main screen body. The screen motion is imparted by an a.c. solenoid giving a stroke of 3/64-in. perpendicular to the screen surface with a frequency of 1,800 per minute.

This unit is a rescreen for the nut coal which carries about 15 tons per hour of slack as it leaves the upper shaker. This screen is taking a 167 ton feed with 15 tons undersize but despite that handicap is passing 0.75 tons per hour through the screen surface which is excellent performance.

TONNAGES

Top Deck	Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4
Maximum size over screen...	18"	18"	1¼"	2"
T.P.H. over screen.....	308	154	100	152
T.P.H. through screen.....	392	154	60	15
Tons per sq. ft. through product	1.4	1.28	1.87	.75
Inclination	2¾" in 12"	2 1/16" in 12"	35°	36°
Second Deck				
T.P.H. over screen.....	167			
T.P.H. through screen.....	225			
Tons per sq. ft. through product	1.12			
Inclination	2¾" in 12"			

Submitted by the District Committee of Northern West Virginia.

SCREEN SURFACES

	Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4
Number of decks.....	2	1	1	1
Top Deck:				
Feed	From End	From End	From End	From End
Width	10′ 0″	10′ 0″	4′ 0″	4′ 0″
Length	29′ 0″	12′ 0″	8′ 0″	5′ 0″
Area (sq. ft.).....	290	120	32	20
Perforations (Fig. 2)—				Wire Screen
Type	Lip (Fig 1)	Lip (Fig 1)	Lip (Fig 1)	(Fig. 2)
Dimension a.....	1⅞″	4¼″	⅞″	1⅛″
b.....	2⅛″	4¾″	(See Note	¾″
d.....	2″	4½″	"A")	
f.....	¾″	1½″		
Thickness of plate...	3/16″	5/16″		
Kind of metal.....	Steel	Steel	Steel	Steel
Second Deck				
Feed	From above			
Width	10′ 0″			
Length	10′ 0″			
Area (sq. ft.).....	200			
Perforations—				
Type	E			
Dimension a.....	⅞″			
b.....	1¼″			
d.....	1″			
f.....	½″			
Thickness of plate...	3/16″			
Kind of metal.....	Steel			

Note "A"—Top 4′ of screen—Dimension b—½″. Bottom 4′ of screen—Dimension b—⅜″. Though this is the case there is practically no plus ⅜″ in undersize or through product.

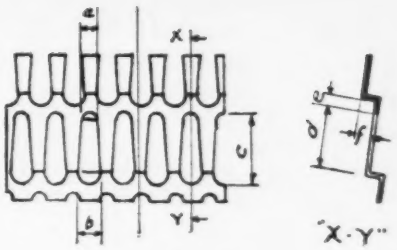


FIG. 1.

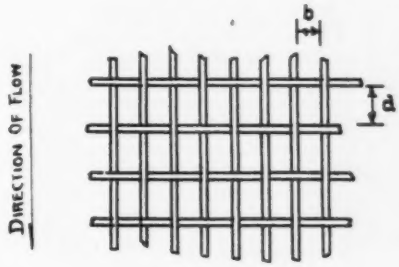


FIG. 2.

Types of Perforations.

Submitted by the District Committee of Northern West Virginia.

Wheels of Government

(*Continued from page* 23)

taxes, whereas the price of the product is fixed.

Attention was called to the discouraging effects on prospecting and on the development of new mineral deposits, upon which the continuation of the mining industry depends. The administration of such a law through a political board holding the power of life and death over American industries and the enforcements of the provisions contained in the bill were shown to be impossible. The statement cited the record of the NRA, where the compliance machinery broke down long before the act was declared unconstitutional.

Full text of Mr. Conover's remarks is carried on page 24 of this issue.

The Wage and Hour Bill is now being considered by each of the Labor Committees of the two Houses in executive sessions and the situation is controversial. Enactment of the measure, undoubtedly in a much modified form, depends upon the date of adjournment of the Congress. There is the issue of the southern wage differential and the further issue of the protection of American industry from foreign imports to be fought out in the committees and on the floors of both Houses.

The Suspension of Annual Assessment Work Bill (S. 187) by Senator Murray of Montana which had lain dormant in Senate and House Committees since early in this session was suddenly brought to life, quickly passed by both Houses and approved by the President late on the evening of June 24. An unfavorable report from the Secretary of the Interior and the expressed attitude of members of both Houses had previously indicated that this bill would not be enacted. It was passed this time with the express understanding that there would be no enactment in the succeeding years. The bill suspends annual assessment on mining claims for the year ending July 1, 1937.

The Stream Pollution Bills still remain in the Committee on Commerce of the Senate. The Vinson planning and survey bill which passed the House two months ago and which is the companion of the Barkley Bill, is understood to be subject to amendment in the Committee on Commerce and may be reported with an amendment by Senator Lonergan providing for mandatory features making it unlawful to pollute a stream after from five to eight years study on the part of a board set up in the Bureau of Public Health. The sponsors of the bill in the House are firm in their position that there should not be any mandatory features in the bill, and the final outcome of the controversy is still in doubt.

The National Bituminous Coal Commission promulgated the Bituminous Coal Code by executive order of the President on June 21. The Commission is proceeding with the organization of the 23 district boards throughout the coal producing areas of the country, and is issuing orders and rulings as rapidly as decisions can be reached. It is reported that practically all of the coal producers have filed for membership under the Code, thus becoming exempt from the 19½ percent tax levied against non-code members. No exemptions have as yet, been authorized for "captive mines" where the mining and consuming companies are not of the same corporate identity. The difficulties which the Commission may encounter in computing the weighted average costs in the various districts may bring about a change in this situation. In any event, all producers must pay the 1-cent per ton tax which will amount in the aggregate to approximately $4,500,000.

Black-Connery Wage and Hour Bills

(*Continued from page* 24)

necessary, for reasons of safety, and such training takes time. In certain states, prospective miners are required to work 2 years under an experienced miner before they are permitted to work independently.

In some cases physical conditions of the mine workings, such as caving ground which requires close timbering, makes operation at least 6 days per week essential, by men familiar with the particular ground conditions, who can thus work safely and efficiently.

Under all these conditions, limitation of present working schedules by a board having the autocratic powers contemplated by these bills would inevitably create hardship and injustice. No matter how flexible the law might be in theory, experience with similar boards in the past demonstrates that they cannot avoid fixation of general standards which are not suited to large portions of the mining industry.

3. *Imposition of onerous conditions through the operation of these bills would undoubtedly force cessation of production in many low-grade and marginal mining properties,* which in the aggregate supply a large portion of the country's needs for minerals and metals, and which employ many thousands of men. Increasing costs of supplies, insurance, taxes, etc., have already brought many such properties close to the breaking point. In gold mining, particularly, where the price is fixed and cannot move up with the general level of commodity prices, the situation of many mines is already precarious.

4. *Enactment of this bill would similarly tend to discourage prospecting and development of new mineral deposits,* upon which the continuation of the mining industry depends. If the developer of a new mine is to be faced with the increased costs and harassment of bureaucratic regulation, the incentive for the necessary exertion and sacrifice is seriously diminished; the normal hazards of new mineral developments are great enough without this extra burden.

5. *These bills would repose in a political board the power of life and death over American industries in all sections of the country.* No board composed of fallible human beings should, in our opinion, have such drastic and potentially dangerous powers entrusted to it.

6. *Adequate enforcement of the provisions of these bills would, in our judgment, be impossible.* This statement is fully supported by the record of NRA. The compliance machinery of that agency had broken down long before the act was declared unconstitutional. Even though a huge administrative organization be set up to enforce the present proposed legislation, the same conditions which caused failure of the NRA would inevitably cause failure in this instance.

We believe that S. 2475 and H. R. 7200 would be unwise, unduly burdensome, and distinctly harmful, not only to the mineral industries, but to the economic structure of our country, and we urge that your committees reject these bills.

The Place of Machines in Production

(*Continued from page* 33)

the week's work with only a checking over by the mechanics, and continue week after week in much the same manner when reasonable care is taken of the machines.

The manufacturers, through the use of their resources, both human and material, have been able to produce a modern machine that is far superior to the older models and can be maintained at considerably less expense to the owner. The designers have placed on the machine overload and safety devices, which will give protection from breakage due to sudden overloads. The machine operator and mechanics should be trained to appreciate the value of these protective devices and keep them in good working order. In the past they have been considered as unnecessary evils and were often removed.

The most efficient operation of any machine is only possible through the proper care and maintenance of it, and the training of the men who operate it to appreciate its value. The machine manufacturer has in mind the production of better equipment, both from the standpoint of service and quality, and to help alleviate the manufacturer are available to the coal operators, and through cooperation can be used to provide equipment that will reduce the operator's cost of producing his coal and permit him to more easily sell in competition with other energy-providing fuels.

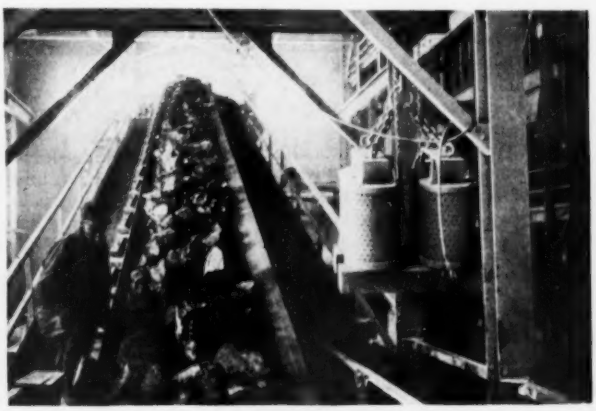
Much progress has been made in the reduction of costs by the coal operators who have taken advantage of modern machines, and much is yet to be gained through the cooperation of the coal-mine management and the manufacturer towards producing equipment that will help to stabilize the industry financially.

Crushing Plant at Climax

(*Continued from page* 69)

fine ore are equipped with motor-driven, revolving rubber brushers for cleaning the sticky ore from the surface of the belt. All of the belt conveyors in this installation are provided with belt training idlers for maintaining alignment of both the carrying and return strands of belt. The drives of all belt conveyors are electric motors transmitting power through enclosed herringbone-gear speed reducers and enclosed roller-chain transmissions. Conveyor No. 21, which is 54 in. wide and over 200 ft. long, handling 1,000 tons per hour with a lift of over 54 ft., and conveyor No. 25, which is 48 in. wide and 311 ft. long, handling 2,500 tons per hour with a lift of about 49 ft., are both provided with tandem drives, and 100-hp. and 200-hp. motors respectively.

This No. 2 crushing plant at Climax is one of the outstanding installations of this year in the metal mining field, and will undoubtedly attract the attention and interest of many mining engineers. The feeders, conveyors, and screens in this plant were designed and manufactured by the Robins Conveying Belt Company, of New York.



54-in. Belt Conveyor No. 21 Carrying Mixed Sizes of Ore to Screening Station at 1000 T.P.H. (Note the Magnets Housed at One Side Which May Be Trolleyed to a Position Over the Ore for Extracting Tramp Iron.)

News and Views

of Interest to Mining Men

Stocks of Refined Copper

According to the Copper Institute, stocks of refined copper in this country underwent an increase of about 9,000 tons during May. They further state that for 13 consecutive months domestic and export deliveries exceeded refined production, and during this period domestic stocks were reduced from 248,704 tons to 99,576 tons.

Steel Research

According to the American Iron and Steel Institute, which represents approximately 90 percent of the steel industry, the research activities of the steel industry during 1937 will reach an expenditure of more than 10 million dollars. This is 12 percent above the total spent in 1936 and nearly 20 percent above the 1929 research budget. More than 2,350 engineers, metallurgists, chemists, and other technical experts are now employed in the research laboratories of the steel industry. The institute also states that a larger share of the steel industry's dollar spent for research in 1937 will be devoted to the study of possible new markets and uses.

Income of Mining Industry

The Treasury's' report on statistics of income for 1934 featured mining and quarrying industries. It shows a total number of returns from 18,656 companies, 4,460 showing net incomes. Gross income of the mining and quarrying industry was $1,161,775,000, and net income $156,063,000. Income tax paid by mining and quarrying was $21,456,000. Excess profits tax amounted to $428,000. There were 9,083 firms showing no net income.

Koppers' Model Town

The Koppers Coal Company is planning a model and modern coal city. The town will be located on Towney's Fork, near Oceana, and on the Virginia Railway. The new mine will have a capacity of 300 cars per day.

Increased Production

Molybdenum production increased 49 percent, according to reports from the United States Bureau of Mines. In 1936 production totalled 2,269,000 tons. Molybdenum is used as a hardening element in the manufacture of steel.

Annual Sports Program

The Pennsylvania and Reading Coal and Iron Company held its annual sports outing at Ebensburg, Pa., on June 19. The principal event was a baseball game between employes representing the Philadelphia and the Pottsville offices. The event was attended by executives of the company.

European Copper Consumption

Cornelius F. Kelley, president of the Anaconda Copper Mining Company, who returned from a trip to Europe on June 8, stated that consumption of copper in Europe is continuing at what are probably record levels. Mr. Kelley stated that so far as he can see, foreign governments are not hoarding the metal and that the greatest percentage of copper consumption is going into plant expansion and rehabilitation.

Statistical Bureau Established By Coal Commission

"The first statistical bureau to be opened by the National Bituminous Coal Commission will be at Fairmont, W. Va., the center of the northern West Virginia field, which in 1936 produced 27,000,000 tons of the nation's bituminous coal.

"Designed as an organization field laboratory, the Fairmont office, the Commission expects, will be in full operation within a week. Hunter S. Kimbrough, staff representative of the Commission, has been assigned to Fairmont to lay the groundwork for organization of the bureau, and will select a suitable office site and make other necessary arrangements.

"Data collated by statistical bureaus will be the basis for the establishment and enforcement of minimum prices for which the bituminous industry will depend for the successful operation under the newly enacted code. Importance of the functions of statistical bureaus and the need for their being manned with trained personnel is stressed by the Commission.

"Coal producers in many instances have their first and only contact with the Commission through the statistical bureaus. A producer accepting the code is obliged to file with his district statistical bureau, among other things, copies of each invoice rendered. Information contained on these invoices will be coded by key punch operators in the bureau. This information will consist of the number of tons shipped, the size and quality of coal and the price which the producer obtains for the shipment, and other pertinent information. All details as to sales will at all times be protected.

"Figures collated by the statistical bureaus will reflect a true picture of coal production and marketing within the statistical bureau area.

"It is expected that between 30 and 35 persons will make up the staff of the Fairmont bureau. Because of its accessibility to Washington, the Commission plans to make the Fairmont bureau a training school for personnel.

"In 1934, northern West Virginia operators established an extensive laboratory at Morgantown, which will be utilized by the district code board for research work. The Commission hopes to be able to establish other research laboratories in colleges throughout the coal-producing areas as provided by the Act of 1937, which provides that the Commission 'shall study and investigate the matter of increasing the use of coal and the problems of importation and exportation.'"

Copper Industry in 1936

The rate of activity at copper mines, smelters, and refineries in the United States in 1936 was sharply higher than in 1935, according to the United States Bureau of Mines. Mine output increased 58 percent; smelter output from domestic ores, 60 percent; and refinery production from domestic and foreign sources, 40 percent. Despite the increases noted, however, production of all three classes in 1936 was less than 70 percent of the annual average for the period 1925-29. Stocks of refined copper at refineries in the United States registered a notable decrease in 1936, and at the end of the year were the smallest on record since 1928. They amounted to only 22 percent of the record inventories on hand at the end of 1932. Stocks of blister copper and materials in process of refining likewise dropped in 1936. Apparent consumption of primary copper jumped 49 percent in 1936 over 1935 and amounted to 84 percent of the annual average for 1925-29. It is not possible to allow for consumers' stocks, which are unknown, in computing apparent consumption. Consequently, any increase in consumers' stocks during 1936 would cause a corresponding decrease in the Bureau's calculation of apparent consumption. Both imports and exports declined in 1936, but as imports fell more than exports, an increase in net exports is indicated. The excess of exports over imports widened in 1936, indicating an increase in exports of copper of domestic origin.

The average price for copper delivered by United States agencies to domestic and foreign purchasers was 9.2 cents a pound in 1936, compared with 8.3 cents in 1935. The average quoted price for electrolytic copper, f.o.b. refinery, was 9.025 cents a pound throughout the first quarter of 1936. In response to record-breaking sales, it moved forward at a comparatively slow pace and averaged 9.525 cents in August and September. The price advanced more sharply in the final quarter of the year, and was 11.775 cents on the last day of the year.

American Society for Testing Materials Holds Symposium on Significance Of Tests of Coal and Coke

The American Society for Testing Materials held an interesting symposium on the Significance of Tests of Coal and Coke on Tuesday, June 29, in the Waldorf-Astoria Hotel, New York City. This was followed by an evening broadcast over the Columbia network from station WABC, featuring a dialogue entitled "Science Tests Materials," between C. L. Warwick, secretary-treasurer of the society, and A. C. Fieldner, president, which included a section on testing coal.

Subjects discussed at the symposium included:

Pulverizer Performance as Affected by Grindability and Other Factors, by Martin Frisch and A. C. Foster, Foster Wheeler Corp.

The Significance of Ash Softening Temperature and Ash Composition in the Utilization of Coal, by A. W. Gauger, Pennsylvania State College.

Interpretation of Laboratory Coal Tests, Proximate Analysis, and Calorific Value, by G. B. Gould, Fuel Engineering Company of New York.

The Significance to the Consumer of Sulphur in Coal, by Henry Kreisinger, Combustion Engineering Corp.

Laboratory Tests Relating to Caking, Plastic, Gas, and Coke-Making Properties of Bituminous Coals, by O. O. Malleis, Appalachian Coals, Inc.

Significance of Friability and Size Stability Tests on Coal, by R. E. Gilmore, Fuel Research Laboratories, Department of Mines and Resources, Canada.

California Mining Legislation

Mining and Industrial News, official publication of the Gold Mining Association of America, in its issue of June 15 points out that the California legislature concluded its 37th session without passing laws detrimental to the present and future development of mines within the state. Numerous bills were before the legislature and those that were passed, it is estimated, are of real value to the industry.

National Safety Competition of 1936

Recognition of outstanding achievement in the prevention of accidents among mine and quarry workers in the United States was given in the announcement of the winners in the National Safety Competition of 1936, made today by Dr. John W. Finch, director, U. S. Bureau of Mines, Department of the Interior.

Three hundred and twenty-eight mines and quarries operating in 36 states took part in this, the twelfth annual contest conducted by the Bureau of Mines.

Four underground mines and one open-cut mine, each a leader in its group, were awarded the "Sentinels of Safety" trophy, donated by the *Explosives Engineer* magazine. Relative standing in the contest was based on the number of days lost from accidents in proportion to the total number of man-hours worked.

Three bituminous-coal mines, 6 nonmetal mines, 9 metal mines, and 66 quarries and open-cut mines were operated during the contest year without a lost-time injury to any of the employes.

The winner of the trophy for anthracite mines was the Raven Run mine, Raven Run, Schuylkill County, Pa. This mine was operated by the Hazle Brook Coal Company and worked 447,360 man-hours in 1936, with 35 lost-time accidents causing 659 days of disability to the employes. The trophy was awarded on the accident-severity rate of 1,473 days lost per thousand man-hours of exposure of the employes to hazard. This mine was in operation 240 days.

For the bituminous-coal mine group, the trophy was awarded to the Coxton mine, Coxton, Harlan County, Ky. This mine was operated by the Elkhorn Piney Coal Mining Company and worked 339,156 man-hours in 1936 without an accident causing loss of time to an employe; the mine was in operation 274 days.

The trophy for metal mines was awarded to the East Vulcan iron-ore mine, Vulcan, Dickinson County, Mich. This mine was operated by the Penn Iron Mining Company and worked 425,374 man-hours during 1936 without a disabling accident; the mine was in operation 221 days.

The trophy for nonmetallic-mineral mines was awarded to the No. 5 Limestone mine, Bessemer, Jefferson County, Ala., operated by the Tennessee Coal, Iron & Railroad Company. There were 114,701 man-hours worked with no disabling accidents, and the mine was in operation for 192 days during 1936.

The Mesabi Chief iron-ore mine, Keewatin, Itasca County, Minn., was awarded the trophy in the quarry and open-cut mine group. The mine was operated by the Hanna Ore Mining Company and worked 308,188 man-hours during 1936 without a lost-time accident, and was active 185 days.

Carson Hill Bought by Anglo-American

The controlling interest in Carson Hill Gold Mining Corporation has been acquired by the Anglo-American Mining Corporation, who recently exercised its option to purchase. Charles W. Segerstrom has resigned as president and the following officers have been elected: A. O. O. Stewart, chairman of the board; Walter Lyman Brown, president; H. W. Klipstein, executive vice president; W. B. Rosecrantz, vice president and secretary; and Lawrence Monte Verda, executive vice president. John A. Burgess was reelected general manager. Frank Wagner, underground superintendent; E. C. Maroon, mill superintendent; H. T. Libby, cyanide superintendent; and A. A. Weisbecker, master mechanic. Under Mr. Segerstrom's direction and rehabilitation of the Carson Hill property, it has produced over 2½ million dollars and its plant capacity was more than doubled.

New Pamphlet

McGraw-Hill Publishing Company has prepared for distribution with the compliments of *Coal Age* a new book on "Coal Mining and Preparation," which is a pamphlet designed to furnish general information on the progress of mechanization.

Largest Benzol Refining Plant

A contract for what will be the world's largest benzol refining plant has been awarded by the Carnegie-Illinois Steel Corporation to the Semet Solvay Engineering Corporation. The plant will be erected at Clairton, Pa., and will be a complete modern unit. Live oils recovered from by-product coke companies will be processed in the new equipment to obtain benzol, toluol, xylol, and solvent naphtha.

Ore Mines Running at Record Rate

According to press dispatches, Minnesota's iron ranges are operating at full capacity to fill the largest demand for ore that they have had in many years. It is estimated that 17,000,000 tons has gone down the lakes since the opening of navigation in May. Ninety-eight percent of the ore in from the Mesabi, Cuyuna and Vermillion Ranges. It is also estimated that more than 70,000,000 tons of ore will be moved, which will establish an all-time record.

Fuel Engineering Conference

Industrial executives and power plant engineers from the lower peninsula of Michigan and northwestern Ohio were the guests of Appalachian Coals, Inc., on June 15, for a fuel engineering conference. This symposium—patterned after the 19 fuel engineers' meetings held in Cincinnati, Ohio, almost every 6 weeks since 1934 and sponsored by the Appalachian organization—offers a "common meeting ground" for "coal producers, consumers, equipment manufacturers, and fuel and research engineers." J. E. Tobey, manager, fuel engineering division, Appalachian Coals, Inc., planned the conference and obtained the services of outstanding speakers.

Mineral Report Ready

The Division of Mines, Department of Natural Resources, under the direction of Walter W. Bradley, state mineralogist, announces that the January, 1937, issue of *California Journal of Mines and Geology*, comprising Chapter 1 of the State Mineralogist's' Report XXXIII, is now ready for distribution. The January quarterly has a report by O. P. Jenkins, chief geologist, on the Source Data of the New Geologic Map of the State, the preliminary issue of which is now ready for the press. C. N. Schuette, consulting mining engineer and geologist, San Francisco, has contributed an article on "The Geology of Quicksilver Ore Deposits," illustrated by sketches and pho-

tographs, which is most timely, considering the higher prices now received for the metal.

This issue also includes a special article on "Prospecting for Lode Gold," by E. D. Gardner, of the United States Bureau of Mines' staff, which will prove of interest and value to both the old timer and amateur prospector and miner. The usual notes concerning Oil Field Development Operations, Statistics, Museum, Laboratory, and Library complete the issue. The price of the January quarterly is 50 cents, which includes shipping charges and sales tax. It may be obtained from the offices of the Division of Mines, San Francisco, Calif.

New Financing Program

Newmont Mining Corporation, American Metal Company, Ltd., Rhodesian Anglo-American, Ltd., International Minerals and Metals Corporation, and other interests have agreed to finance the properties now owned by the O'Kiep Copper Company, Ltd., of South Africa. These interests have agreed to provide the company with $7,000,000 and have subscribed for 2,960,000 shares of stock. The O'Kiep Copper Company, Ltd., has recently been organized under the laws of South Africa. The officers of the company are H. DeWitt Smith, president; H. K. Hochschild, vice president; Fred Searls, Jr., vice president; and Henry E. Dodge, secretary and treasurer. It is estimated that developed ore reserves approximate 10,200,000 tons, averaging 2.45 percent copper.

N.L.R.B. Decisions

After July 1, 1937, all decisions of the National Labor Relations Board will be printed at the Government Printing Office and distributed from there by the Superintendent of Documents. No decisions will be available after July 1 at the offices of the Board. Those desiring to receive Board decisions after July 1 should send their subscription immediately to the Superintendent of Documents.

Subscriptions may be had at the rate of $1.50 for a volume of approximately 1,000 pages. Those subscribing will automatically receive each Board decision as it is issued, up until that time when the decisions so distributed total approximately 1,000 pages. At that time the subscription will have run out, and it will become necessary to subscribe to a new series of decisions. Subscribers will be notified when the time for renewal approaches. While it is not possible to forecast accurately when this volume of 1,000 pages will be declared closed, it is expected to cover decisions for six months or more.

Chief Appointed

Arthur Johnson, of Chicago, has been appointed acting chief of the statistical bureau to be established by the National Bituminous Coal Commission at Chicago.

Intense Building Activity at Ajo, Ariz.

Cornelia Mine Enlarges Plant

Intense building activity marks the city of Ajo today as the Phelps Dodge corporation expands the production capacity of its New Cornelia mine.

The noted open pit copper mine is being enlarged in every branch, as the big mining company pours over $2,000,000 into the plant. Though the mine was worked at least as early as 1750 by the Indians, it is in many respects the most modern in the country.

A conspicuous sight at Ajo today is the building of 50 new houses for the workers. These houses have steel windows, stucco walls and are covered with copper roofs.

The copper roof order alone broke all records as the largest ever placed.

The roof chosen is of the double-lock type which was invented in Arizona several years ago and has now spread all over the country. The construction method cut costs in half and made copper roofing available for the average residence. As a result, the mines of Arizona have had their market enlarged by this fast growing Arizona industry which is already using over 1,000,000 pounds of its copper each year.

The roofs at Ajo are being applied by the Copper Roofs Company of Phoenix. Phelps Dodge has been using these roofs for years as have such other well known producers as American Smelting & Refining Company, Anaconda Copper Mining Company, Inspiration Copper Company, Magma Copper Company, United Verde Copper Company and the International Smelting Company. In Arizona alone many hundreds of copper roofs stretch from one end of the copper state to the other.

Other appointments announced by the commission are:

Stanley E. Disney, Muskogee, Okla., legal division.

Charles S. Mitchell, Tupelo, Miss., legal division.

J. D. Seaman, Des Moines, Iowa, special agent.

Arthur Sturgis, Chevy Chase, Md., examiner.

Joseph D. Dermody, Terre Haute, Ind., legal division.

Edward F. Meany, Albany, N. Y., price examiner.

Thomas J. Nash, Washington, D. C., special agent.

New Power Plant

Two companies, Pend Oreille Mines and Metals Company and American Zinc, Lead and Smelting Company, are doing practically all the work in the Metaline district, but their operations are extensive. The former company is striving to complete its new power plant in the Pend Oreille River, which will give it 2,000-h.p., and which probably will be ready in July. Because of lack of power, the company has been operating its mill with only one shift. With the additional power it expects to increase its milling capacity to 1,000 tons a day, go onto a three-shift basis, have power to develop the Reeves McDonald property 8 miles distant across the Canadian line, furnish the town of Metaline Falls with power, and be able to supply other industries.

American Zinc, Lead and Smelting Company is completing its 4,600-ft. tunnel in the property of the Metaline Mining and Leasing Company and from this tunnel it will explore the ore bodies. The American Zinc Company also has started diamond drill explorations of the Grandview mine on the other side of the Pend Oreille River.

Mechanization Progress 1877-1937

The progress of mine mechanization, 1877-1937, is dramatically depicted by these two bronze bas-relief murals, on exhibit in the main office of the Jeffrey Manufacturing Company, in Columbus, Ohio. In the pre-mechanization period, see upper mural, our mines had no means to alleviate weary muscles, relax straining backs, or relieve sore hands . . . nor means to improve the quality and worth of their product. The only machines were the men of the mines wtih their picks, shovels and hand drills; the only locomotive was 'Jenny Mule.' The lower mural typifies mechanized conditions as they are today.

New Mill Put in Operation

Hecla Mining Company has placed its new 200-ton mill at the Polaris mine in the Coeur d'Alenes into operation and made its first shipment of concentrates June 16. The product is sent by truck 5 miles to the Bunker Hill smelter at Kellogg. This culminates 2 years of intensive development in this property in which large bodies of silver-lead ores have been blocked out in the Polaris mine in the silver belt of the Coeur d'Alenes. The Hecla has large and rich holdings in this property, which adjoins the Sunshine mine.

The Hecla also has a half interest in another new mill of 750-ton capacity which will be in operation probably in July. This is the Star mill at Burke, Idaho, adjoining the Hecla surface plant. The Star mine and enterprise is owned by the Sullivan Mining Company, which is owned jointly by the Hecla Mining Company and the Bunker Hill Mining Company.

Do You Know That—

Making coal give off heat without burning it, sounds like black magic; but it is done, and is explained by the fact that dark colors absorb heat from the sun more readily than do light ones and therefore radiate more heat. And what useful purpose does this serve? Russian farmers are said to speed up the maturing of their cotton crops by a month and more by spreading a thin layer of coal dust over their fields, using about 100 pounds to the acre. In the daytime it stores up heat in the underlying ground, thus making for a higher average temperature not only during the hours of night but during the entire growing season. (*Safetygram.*)

Unemployment Investigation

Vice President Garner appointed five Senators as members of a special committee authorized by the Hatch resolution (S. Res. 36) to investigate unemployment, particularly that caused by machines. Members of the committee are Senators Byrnes, Clark, and Hatch, Democrats, and Frazier and Davis, Republicans.

In addition, the Senate passed and sent to the House for concurrence a second resolution which would authorize a study into unemployment and relief, particularly the latter. Sponsored jointly by Senators Murray and Hatch, the resolution would call upon the President to name a commission of 15 "prominent citizens" to serve without pay, to study the problem of relief and what can be done about it. Their findings would be made to the Congress. A fund of $50,000 would be set aside from relief funds to conduct the study. The Senate authorized the expenditure of $10,000 for the unemployment study already approved.

Iron Industry in 1936

The best year since 1930 was experienced by the iron ore industry of the United States in 1936, with an increase of 60 percent over 1935. Even this excellent record, however, was still 25 percent below the 1925-29 average. There were 196 mines that produced the tonnage; 11 of these each produced more than 1 million tons. Total production for 1936 was 48,788,745 gross tons. Shipments of iron ore in 1936 amounted to 51,465,648 gross tons. Stocks of iron ore

at the mines decreased 30 percent during 1936 and at the end of the year were 5,441,608 gross tons, the lowest since 1907. Imports of iron ore amounted to 2,232,229 gross tons, with Chile the chief source of importation.

Mining Society of Nova Scotia Celebrates Its Fiftieth Anniversary

The Mining Society of Nova Scotia, affiliated with the Canadian Institute of Mining and Metallurgy, observed its golden jubilee in Halifax on June 21 to 23. The society has the distinction of being the oldest mining fraternity in Canada, and is a direct outgrowth of the Gold Miners' Club of Nova Scotia, organized in March, 1887, at a period when gold-mining industry was most prominent in Nova Scotia.

The club had 17 charter members, and a year later this informal club organized as the Gold Miners' Association, membership being restricted to those directly associated with the gold-mining industry.

Mica Industry in 1936

The domestic production of sheet and scrap mica increased in 1936 to 21,615 short tons, valued at $464,473, from 19,320 tons, valued at $405,101, in 1935, according to reports furnished to the Bureau of Mines by producers and consumers of mica. The increase in tonnage was largely the result of further improvement in demand for ground mica for roofing purposes, but production of all kinds of mica increased in the United States and imports increased greatly, reflecting active demand in practically all branches of the consuming industries. The improvement in demand was worldwide, owing to general industrial revival and also to the fact that a good deal of mica evidently went into war materials or simply was stocked in European countries as a guaranty against the contingency of war. Condensers, airplane spark plugs, and other vital parts for modern communication and transportation equipment are large consumers of mica.

Sentinels of Safety Trophy

The Sentinels of Safety Trophy in connection with the national safety competition of 1936 has been awarded to No. 5 limestone mine of the Tennessee Coal, Iron and Railroad Company. Records indicated that the property was in operation for 114,071 man hours during 1936 without an accident causing a disabling injury to any employe. The United States Bureau of Mines, which has conducted these national safety competitions for the past 12 years, will also award a certificate of honor to each employe and official of the No. 5 mine.

A Revival of Gold Mining In Nova Scotia

The production of gold in Nova Scotia has increased from around 1,500 fine ounces in 1933 to almost 13,000 in 1936, according to a statement of J. P. Messervey. This production was the output of 22 operators, 13 of whom were in continuous operation, and it is expected that five intermittent producers will be in steady operation in 1937. Gold was first discovered in Nova Scotia in 1858 by Colonel L'Estrange while hunting in Mooseland. Prospecting became general, and production reached its peak of 31,000 oz. in 1898. With the discovery of the Klondyke in about that time, the rich silver mines of Cobalt in 1903, and the gold deposits of Porcupine in 1912, interest in Nova Scotia gold mines waned until in 1921 production was only 378 oz.

Mining Road Bill

A bill which would authorize the expenditure of $1,500,000 for each of the next two fiscal years for the construction of roads and trails within national forests for the purpose of aiding in the development of mineral resources has been introduced in the Senate by Senator Murray (Dem., Mont.) The measure was referred to the Senate Committee on Agriculture and Forestry. No arrangements have yet been made for hearings.

Correction

We wish to correct an error in the article "Accident Prevention and First Aid in Cyanidation and Flotation Plants," by M. W. Von Bernewitz, which appeared in the April issue of MINING CONGRESS JOURNAL.

Under the subhead, "Protection Against Gas" it says "Skin absorption of cyanide becomes a critical factor in the protection of men from these fumes. It is impossible for a person to be overcome by cyanide fumes while wearing a gas mask which is giving 100 percent respiratory protection." The word "impossible" should be "possible."

We regret that this error occurred.

—*Personals*— . .

John Stuart, of New York, has been named acting director of public relations by the National Bituminous Coal Commission. Mr. Stuart was for many years a Washington and foreign correspondent for New York newspapers and press associations.

Geo. W. Hallock has been elected president of the California Hydro Mining Association. W. W. Esterly was reelected secretary of the association. Mr. Hallock is president and general manager of the 16-to-1 Extension Mine.

James Dickson has been appointed comptroller for the Anaconda Copper Mining Company.

Dr. F. M. Becket, president of the Union Carbide & Carbon Research Laboratories, Inc., has been awarded the Acheson Medal and $1,000 prize by the Electro-Chemical Society for his outstanding contributions to electro metallurgy.

Lucien Eaton, consulting engineer, is in Michigan in connection with the plans of the Copper Range and the Isle Royal Copper Company, which are preparing to resume production.

John O. Smith has accepted appointment as acting chief, marketing division, National Bituminous Coal Commission, Washington, D. C. He formerly served as a member of the marketing division, Appalachian Coals, Inc., for four years, working under A. L. Brown, manager.

Cornelius F. Kelley, president of the Anaconda Copper Mining Company, is in London on business for his company.

An honorary degree of Doctor of Science was presented to **B. F. Fairless**, president, Carnegie-Illinois Steel Corp., by Kent State University, Kent, Ohio.

H. C. Dudley has recently been in Mexico on business for his companies which operate properties in Chihuahua.

Hugh M. Wolflin has joined the staff of the Idaho-Maryland Mines Corp., and will be located at Grass Valley. His work will be that of personnel management and safety. He formerly was associated with the Industrial Accident Commission of California.

Anthony Anable has been elected a member of the alumni council of the Massachusetts Institute of Technology.

Herbert Hoover has been appointed chairman of an advisory mining council in connection with the exhibit of the mining industry at the 1939 Golden Gate International Exposition. The council will be known as Mining Exhibits, Inc. A part of their plan is the building of an actual mine with miners and college students acting as guides. Among the well-known mining men included in the council are **B. C. Austin, Roy N. Bishop, H. W. Gould, W. W. Bradley, H. W. Klipstein, P. R. Bradley, W. W. Mein, Walter L. Brown, Charles W. Merrill, E. L. Oliver, S. L. Rawlings, Stanly Easton, John A. Fulton, Frank H. Probert**, and **Lawrence K. Requa.**

John W. Davin, assistant to the president of the Chesepeake and Ohio Railroad has been appointed to the vice presidency of the Western Pocohontas Corporation and the Western Pocohontas Fuel Company, subsidiaries of the railroad. He will continue to act as assistant to President Harahan.

W. W. Dartnell

Preparatory to further increasing their activities in the mining machinery field, the Sullivan Machinery Company announces the appointment of **W. W. Dartnell** as assistant general manager of their mining machinery division. Mr. Dartnell was formerly manager of mines, Valley Camp Coal Company. His extensive experience with mining machinery application and coal production particularly suits Mr. Dartnell to his new responsibilities.

U. C. Tainton, electrometallurgist, is in Europe, and will not return to this country until late in August.

John G. Baragwanath, president of Pardner Mines Corporation, has been elected to the board of Dome Mines, Ltd.

L. E. Young, vice president of the Pittsburgh Coal Company, was a guest at the Oldtimers' Association meeting of the Union Pacific Coal Company.

M. L. Peltier, vice president of the Peabody Coal Company, Chicago, Ill., has been elected president of the Illinois Coal Operators' Association. Mr. Peltier takes the place of W. J. Jenkins, Consolidated Coal Company, who recently resigned as president of the association.

Stanley Walker, mining engineer, has been appointed superintendent of Lakeside Monarch Mining Company, of Colorado.

A. O. Stewart has been elected chairman of the board of the Anglo-American Mining Corporation, Ltd.

John D. Battle, secretary of the National Coal Association, addressed the recent meeting of the American Retail Coal Association in Chicago.

Edward C. Congdon has been elected president of the recently incorporated Polaris-Taku Mining Company, Ltd., which will operate a gold mine in British Columbia. W. B. Congdon is vice president; B. B. Nieding is general superintendent; B. C. Sharpstone is consulting geologist; and George G. Griswold is consulting metallurgist for this company.

H. V. Welch, metallurgical engineer, is in South America, where he will visit all the important mining and industrial districts, returning to this country in the early fall.

Marshall John H. Jones, president of Jones Collieries, Inc., has returned to Pittsburgh after an extended western trip, which included the northwest territory.

H. H. Montgomery has been appointed resident engineer and geologist for the American Rand Corporation.

Carl T. Ulrich, vice president of the Kennecott Copper Corporation, sailed on the *Normandie* on May 19 for a stay in Europe.

W. L. Honnold recently received the honorary degree of Doctor of Engineering from the Michigan College of Mining and Technology, from which school he graduated in 1895.

George S. Rice, for many years associated with the United States Bureau of Mines, and distinguished mineral authority, attended the fiftieth anniversary of the class of 1887 of the Columbia School of Mines at Columbia University.

Frederick Laist, Anaconda Copper Mining Company, was recently elected president of the new National Tunnel and Mines Company, which is a merger of the Utah-Delaware and Utah-Apex Company.

J. V. N. Dorr is in Europe.

H. D. Keiser, formerly of the editorial staff of *Engineering and Mining Journal*, has joined the staff of the United States Geological Survey, and has been assigned to the mining division at Washington, D. C.

E. O. Sowerwine has been appointed assistant to the president of the Anaconda Copper Mining Company.

Guy C. Riddell, consulting mining engineer, is in Mexico in connection with work for the Calabacillas Gold Mines.

Arthur Notman is again at his New York office, after spending several months in the west on professional business.

D. C. Jackling is in England, where he will be for several weeks on business and pleasure. He attended the coronation ceremonies.

—*Died*—

Frank M. Smith, director of the Bunker Hill Smelter and for many years affiliated with the Bunker Hill & Sullivan Mining and Concentrating Company, died on June 1 at his home in Spokane, Wash. He had retired in 1935. Mr. Smith had

Frank M. Smith

taken an active interest in the work of the American Mining Congress and the Northwest Mining Association.

A. L. Hurley, president and general manager, Park City Development Company, Park City, Utah, died on June 17. He was a director of the Utah Chapter of the American Mining Congress.

Oscar Cartlidge died on June 9. He was former chief of the Mine Rescue Station for the State of Illinois, and was at one time affiliated with the Raleigh Wyoming Coal Company. More recently he was associated with the Marietta Manufacturing Company, and was interested in the development of mechanical loaders.

John T. Connery, president of the Miami Coal Company, died June 5. He had been president of his company since 1904, and was well known in Illinois coal circles. He was also president of the Edgewater Beach Hotel Company.

Willis Law Tinker, secretary of the Lake Superior Iron Ore Association, died on June 7. He had spent 33 years in the work which had brought him prominence in the iron and steel industries. Mr. Tinker was a member of the American Institute of Mining and Metallurgical Engineers and of the American Mining Congress.

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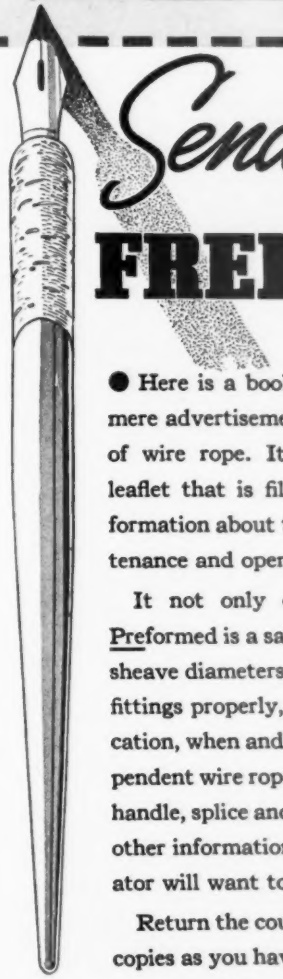

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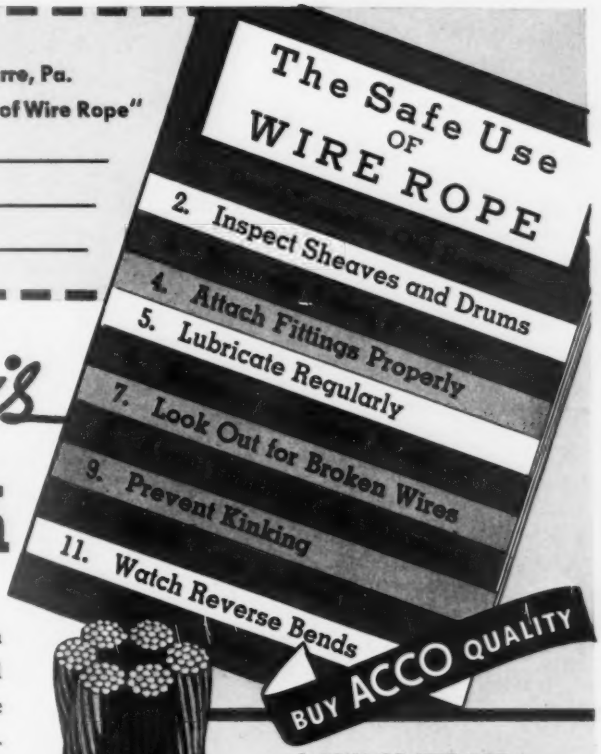

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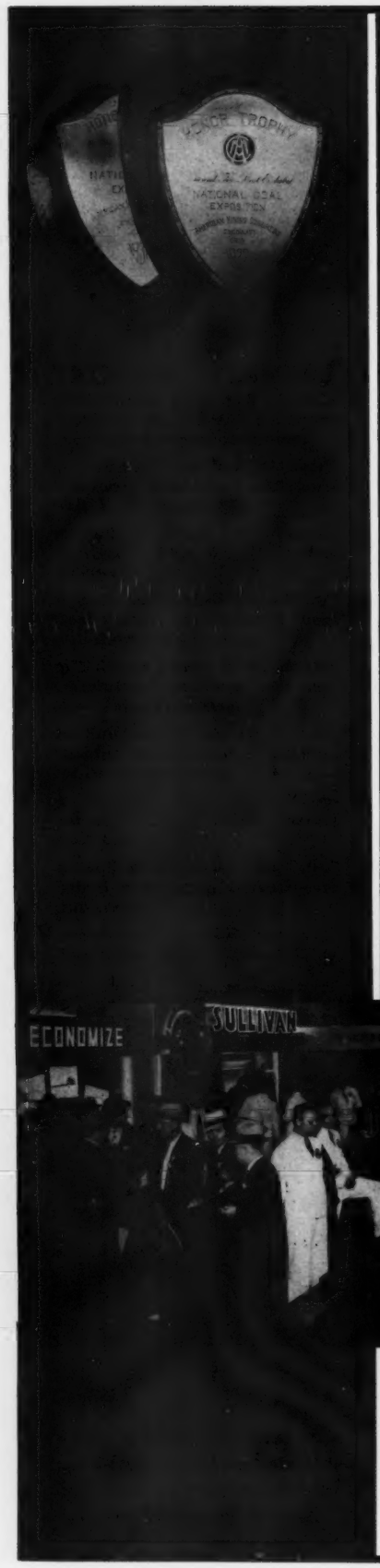

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